AN ANALYSIS OF SEX DIFFERENCES IN AN ALBERTA SCHOOL POPULATION

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HILDRETH FRANCIS SLY

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Thesis
1960(F)
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THE UNIVERSITY OF ALBERTA

AN ANALYSIS OF SEX DIFFERENCES IN AN ALBERTA SCHOOL POPULATION

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
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OF DOCTOR OF EDUCATION

DIVISION OF EDUCATIONAL PSYCHOLOGY

by
Hildreth Francis Sly

Edmonton, Alberta
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ABSTRACT OF THESIS

Data collected during the testing program of the Clover Bar School Survey included intelligence and achievement test scores for nearly 3,000 children in grades one to twelve. When the data were analyzed statistically for sex differences, definite trends and patterns of performance in both achievement and intelligence emerged. For the most part, the emerging patterns corresponded to those already observed and reported by previous workers, yet differences contradictory to generally accepted findings also appeared.

The well recognized over-all superiority of the girls in linguistic skills was readily apparent, confirming the indication of a culturally, and even biologically, based tendency toward a social orientation and communication which is greater for the girls than for the boys. This was definitely supported by the results of the language tests. The pattern of sex differences in reading skills--an early but diminishing female superiority--corresponded to previously observed comparisons between the sexes, although the finding of no consistent pattern of sex differences in listening skills which emerged from the data must await verification by more refined testing instruments.

An increasing male superiority in mathematics and science, as well as an inconclusive pattern of sex differences in social studies achievement, also tended to support general research findings suggestive of greater male competence in reasoning, problem solving and abstract thinking. It has been suggested that a general masculine superiority in these achievement areas is due possibly to diverging interests and activities, to less restricted activities among males, and to a cultur-

ally enforced acceptance of imposed sex roles.

Evidence contradictory to previous findings seemed to appear, however, in sex comparisons of intelligence test scores. A suggestion of a definite tendency toward intellectual female superiority appeared in grades four, five and seven--significantly so in Otis I.Q. scores, and apparently in quantitative intelligence. This is the period of prepuberal accelerated physical growth in the female and is suggestive of a corresponding period of accelerated intellectual growth. Such a tendency, however, has not been reported in other studies, nor do the achievement scores in the present study support this finding of prepuberal female intellectual superiority. It is a point of interest which could easily have been the result of a limited or biased sample.

Another finding emerging from this study, while consistent with the hypothesis of sex equality in intelligence but at variance with the findings in achievement in language, was a lack of significant differences favoring the girls in verbal intelligence test scores. Apparently the greater facility of the girls in language mechanics and expression may stem from their greater concern for social orientation and communication without the necessity for innate superiority in verbal intelligence.

With reference to sex differences in personality, behavior, and physical traits, the findings of this study were in harmony with previous research except for the conclusion that the girls were considered more emotionally stable than the boys, a situation contrary to published reports of similar studies. Since this study was limited to rating by teachers, and there is excellent research evidence supporting the conclusion that teachers of both sexes tend to rate girls more

highly than boys, this departure from the findings of previous research is not unexpected.

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H.F.S.

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CHAPTER ONE

THE PROBLEM

In popular and scientific writing attempts have been made to demonstrate, in almost every aspect of human development, the superiority of one sex over the other. There are obvious physical differences. Physiological maleness and femaleness are present at birth. From early childhood biological and cultural factors combine to produce sharp contrasts in structure and function between the adult male and the adult female. The nature and extent of psychological and behavioral differences are not so readily determined. These also owe something to biology and to the culture which enfolds the individual. Yet even today, in spite of the considerable research done on this topic, we are far from the point of definitive statement. While a reading of the relevant literature will reveal areas of broad agreement, dissension exists over almost every specific issue. It is to be hoped that future research will yield more precise information to guide administrative policy-making, curriculum construction, and the development of teaching method.

Analysis of the Problem

It has not been established that the sexes differ in general mental ability. Available studies present conflicting evidence. Even when significant differences are found there is considerable argument about their interpretation. In the first place, different researchers use different tests on different populations, and their results naturally fail to correspond. Secondly, selective factors operating within

the higher grades of a school population frequently make the sex groups not truly comparable. Thirdly, the considerable intra-sex variability and inter-sex overlapping in test score add to the difficulty of generalizing whatever differences emerge from a research study. A further complicating factor suggested by Anastasi (1958) is the superior rate of physical development shown by girls in early life. Some writers have advanced the hypothesis that the biological growth pattern responsible for this physical acceleration may also lead to acceleration in mental development. When we consider, finally, that the treatment of boys and girls is culturally differentiated in our society, and that intelligence tests are so designed as to exclude items showing large sex differences, it is difficult to disagree with McNemar (1942) that definite conclusions cannot be drawn with respect to innate sex differences in general mental ability.

Research in achievement provides more substantial evidence for the existence of sex differences. These have been found in the broad areas of general scholastic achievement and school progress as well as in special subject fields. Here too, however, it is difficult to disentangle biological and cultural factors, and to assess the influence of conditions peculiar to individual investigations.

While there have been many investigations into sex differences in school children, not many studies have been reported for large groups of Canadian boys and girls. Conclusions based on the performance and behavior of American and British children are generally applicable to the boys and girls in Canadian schools. Nevertheless, data relating to the performance and behavior of local children are necessary to provide a sound basis on which to re-examine and modify local curriculum content and teaching procedures.

A major Canadian study in this area was made by Dunlop (1947). This was a ten-year survey of differences in mental ability and achievement of grade four boys and girls in the Ottawa schools. A summary of sex differences in the incidence of unhealthy personality and behavior traits among Canadian children has also been compiled (Wright, 1956). Research projects and theses completed at the University of Alberta have provided a considerable body of information on Alberta boys and girls. More and more studies, however, are required to compile the statistical data which will throw more light on the local and Canadian situation.

Assumptions and Hypotheses

For the purposes of this study, sex differences are limited to differences in mental ability, academic aptitude, school achievement and a limited number of adjustment variables. Distinction is made here between mental ability and academic aptitude to the degree that an intelligence test is composed of items of a symbolic nature or of items phrased in terms similar to materials presented in the classroom. Although both tests attempt to measure intelligence per se, the former is referred to as a measure of mental ability, the latter as a measure of academic aptitude. It is assumed that the sample selected for study constitutes a typical sample of the Alberta and Canadian school populations in grades one to nine. Because of provincial variations in educational structure and policy this assumption is less valid for the remainder of the sample in grades ten to twelve. The hypotheses stated below arise from a careful review of the literature on sex differences. These are as follows:

1. Boys and girls do not differ in amount of general intelligence.
2. The boys perform better in achievement in mathematics, science and social studies.

3. The girls perform better in achievement in language, reading, listening, essay and writing.

4. There is no appreciable difference in variability in general intelligence or in achievement.

5. The boys tend to be more aggressive and the girls more cooperative and emotionally unstable.

6. The boys show a greater incidence of speech difficulties, visual and hearing defects, and enuresis.

CHAPTER TWO

DESIGN OF THE STUDY

Periodic stocktaking is sound business practice. A re-examination of basic procedures, an interpretation of trends, and a restatement of objectives in the light of changing conditions are essential for the continued provision of effective services. School trustees and educators, too, if they are to continue to make sound judgments with respect to curricula offerings and instructional practices, must periodically re-examine their basic procedures, interpret trends, and restate their objectives. This was the overall purpose of the testing program of the Clover Bar School Division. A specific purpose was to accumulate a fund of statistical data on which to base decisions for future policy making.

The present study, with its centre of interest in sex differences, is one of a series which attempts the analysis and interpretation of these data. Its object was to highlight significant differences, especially in mental ability and achievement, within the Clover Bar school population.

The Testing Program

The survey of the schools of the Clover Bar School Division was authorized by the Board of the Division early in 1958. By March of the same year arrangements for the testing had been completed. Two one-day workshops were held. In these the teachers of the division were given instructions on administering the tests and completing the questionnaire used in the survey. The actual testing, completed within two days in each school, was conducted throughout the Division during

two days in each school, was conducted throughout the Division during the periods March 17 to 20 and March 25 to 28. One-half of the schools were tested during each period.

The results of the testing program, with specially prepared profile forms for the teachers, were delivered to the Superintendent's office early in June at which time an interpretation workshop was held for the divisional board. A similar workshop for principals was conducted on June 17, with another for teachers on September 6 during the divisional institute.

The Clover Bar School Division, containing twenty-one town, village and rural schools, is located in north central Alberta. Enrolment at the time of the survey included 2,847 students in grades one to twelve. Because of the absence of some pupils when the various tests were administered and the questionnaires filled out, complete scores were obtained for only 2,799 students, 1,441 of whom were boys, and 1,358 girls. Enrolment by sex and grade is shown in Table I.

TABLE I.

NUMBER OF BOYS AND GIRLS ENROLLED BY GRADE IN THE CLOVER BAR SCHOOL DIVISION, MARCH, 1958

Grade	Boys	Girls	Total
I	180	192	372
II	167	149	316
III	151	120	271
IV	160	147	307
V	134	151	285
VI	127	130	257
VII	124	109	233
VIII	124	104	228
IX	100	106	206
X	73	77	150
XI	59	43	102
XII	42	30	72
Total	1441	1358	2799

Four tests were used to gather the information on intelligence and achievement. The committee selected two of the older and more familar tests published by the World Book Company (Yonkers-on-Hudson, 1953)--the Otis Quick Scoring Mental Ability Tests and the Stanford Achievement Test Battery. The remaining two tests were the relatively new type of tests recently published by the Educational Testing Service (Princeton, New Jersey, 1957). These were the Cooperative School and College Ability Tests and the Cooperative Sequential Tests of Educational Progress. A listing of the tests with their forms and grades is given below, followed by a brief description of each.

1) Otis Quick Scoring Mental Ability Tests
   New Edition, Alpha Form, Grades 1 to 3
   New Edition, Beta Form, Grades 4 to 8
   New Edition, Gamma Form, Grades 9 to 12
2) Stanford Achievement Test Battery
   Primary Form, Grades 1 and 2
   Elementary Form, Grade 3
3) Cooperative School and College Ability Tests, Grades 4 to 12
4) Cooperative Sequential Tests of Educational Progress, Grades 4 to 12.

Otis Quick Scoring Mental Ability Tests (Otis)

All three levels of the Otis were used in the Clover Bar Testing Program. The Otis Alpha provides non-verbal, verbal and total scores. The Beta and Gamma Forms each yields only one score.

These tests are composed of multiple choice items graduated in difficulty from the familiar and concrete to the more abstract problems.

Stanford Achievement Test Battery (SAT)

The Primary Form of this battery was administered to grades one and two, the Elementary Form to grade three. There are five tests in the Primary Form-- paragraph meaning, word meaning, spelling, arithmetic reasoning, and arithmetic computation. The Form for grade three includes a sixth test, language.

The Cooperative School and College Ability Tests (SCAT)

The School and College Ability Tests consist of two tests yielding three scores, Verbal, Quantitative and Total. The Test Manual, page 5, suggests that the Verbal score is designed to measure ability to understand sentences and give the meaning of words, while the Quantitative score measures ability to perform operations with numbers and to solve mathematical problems. The Total score aids in estimating the capacity of a student to undertake the academic work of the next higher level of schooling, and may therefore be considered a test of academic aptitude.

The Cooperative Sequential Tests of Educational Progress (STEP)

The STEP battery consists of seven tests, each of which is described separately below. Each test has four levels and all were used in this study. Level One was used for grade twelve, Level Two

for grades ten and eleven, Level Three for grades seven to nine, and Level Four for grades four to six.

The STEP tests are problem solving tests in particular broad subject fields. They are designed to measure critical skills and understandings that are basic to each subject field. They do this, not in terms of factual recall, but by demonstration of ability to apply knowledge or learning to meaningful and realistic problems. This type of problem solving approach is not related to any set method of testing curricula or particular texts. The tests are more closely related to the measurement of general educational background through their broad integration of specific content and skill areas.

STEP Mathematics Tests. These tests attempt to measure a student's ability to recognize and apply the concepts of number and operation, symbolism, measurement and geometry, function and relation, deductive and inferential reasoning, and reliability and statistics.

STEP Science Tests. The science tests are designed to measure ability to use scientific knowledge to solve problems. They attempt to measure the following six areas that would seem to be common to any list of scientific reasoning abilities: ability to identify and define scientific problems, ability to suggest or invent hypotheses, ability to select valid procedures, ability to interpret data and draw conclusions, ability to evaluate critically claims or statements made by others, and ability to reason quantitatively and symbolically.

STEP Social Studies Tests. These tests are made in the United States and have, therefore, an inherent cultural bias in content. They are designed, however, to measure skills and basic understandings of a democratic society and therefore were considered appropriate for Alberta boys and

girls. The tests include seven abilities involved in critical thinking and analysis, and eight understandings in social, geographical, political and economic fields.

STEP Communication Tests. The STEP battery has four tests in the communication area, each of which is reviewed in this section. The tests measure reading, writing, listening and essay skills.

STEP Reading Tests or Reading Comprehension Tests measure five reading skills: ability to reproduce ideas, ability to translate ideas and make inferences, ability to analyze motivation, ability to analyze presentation, and ability to criticize. These tests are quite similar to previous standardized reading tests.

STEP Writing Tests attempt to evaluate the skills involved in the process of good writing. The evaluation is achieved by 'revision items', that is, the testee is asked to identify errors or weaknesses and select a revision which most adequately solves the problem in relation to the purpose of the writing. It is interesting to note that the materials used in the Writing Tests were chosen from actual writings of students in the schools.

The STEP Listening Comprehension Tests reflect a new trend in communication evaluation based on research that has established a close relationship between listening ability and reading difficulties. The tests are designed to measure skill in understanding, interpreting, applying, and evaluating what one listens to.

STEP Essay Tests are the first attempt to make available to the teacher a standardized test of this type. They are free-response tests of writing ability and are scored by comparing the result with a pre-

scored essay on a seven point rating scale in much the same manner as handwriting tests are scored. The teacher is provided with a comparison essay as a standard by which she can rate her students knowing that the standard has been set by a group of experts. Subjectivity of scoring is therefore kept to a minimum.

The Student Data Assembly Sheet

Another major source of information about the pupils was the Student Data Assembly Sheet (Appendix A). This questionnaire was completed for each pupil by the classroom teacher. Six main subdivisions of information were supplied. The identifying data included the name, age, sex and birthplace of pupils and parents as well as the languages spoken in the home. The family section yielded information concerning parents and siblings, the length of time the home had been in the present locality, and the ownership of home, car or television. The educational data dealt with age on school entrance, school progress, school attendance, and school changes. The occupation of the parents, place of employment and financial returns indicated the economic status of the family. The final section on biographical information permitted the rating of the students on six prominent behavioral characteristics: social participation, aggressiveness, honesty, truthfulness, cooperativeness and emotional stability. The teachers used a five point rating scale ranging from 'slight' to 'very marked'.

A medical section was also included in the Data Sheet. This provided information which, it was felt, might have a bearing on the student's performance in school. Data were obtained relative to premature birth, congenital physical defects, allergies, hearing and vision, tuber-

culosis, enuresis, and stammering and stuttering. Unlike the other information which was compiled by the teacher, the material for the medical section of the questionnaire was provided by the Leduc-Strathcona Health Unit.

Analysis of the Data

Test scores, biographical data and teacher ratings were analyzed to reveal differences between the boys and girls in the Clover Bar school population. Since the wide variety of scores used in this study required a common working base, and since the study was concerned only with the relative differences of scores between the sexes, the search for readily evident trends and their implications, standard scores were preferred to raw scores. The raw scores from the testing program were converted to stanines and transferred to IBM cards. These stanine distributions provided the basic data for the study.

A stanine is a standard score dividing a distribution into nine parts numbered from one to nine beginning at the lower end of the distribution. The fifth or middle stanine contains 20 per cent of the scores of the distribution; the fourth and sixth each contains 17 per cent of the scores; the third and seventh, the second and eighth, and the first and ninth, each contains 12, 7, and 4 per cent respectively of the scores. In a normal distribution the width of each division is half a standard deviation with stanine five ranging from - .25 S.D. to +.25 S.D.

Statistically, the procedure consisted of testing for significant differences between the means of the boys' and girls' scores for each subtest in each grade. To test for significance of differences

in ability and achievement, the F-test and t-test were used. The Cochran-Cox test was applied where necessary to establish homogeneity of variance. The nonparametric χ^2 was used to test for relationships among the personal and behavior variables.

Outline of the Study

The data for the study have been organized into separate, independent chapters each with its own development, analysis, summary and conclusions. This type of organization seemed desirable in view of the complexity of the information and the number of categories involved. The introductory chapters pose the problem, provide the background for the study, and describe its design. The three subsequent sections are devoted to the major topics of intelligence and achievement. These topics are discussed under four subheads: related studies, the Clover Bar data, patterns of sex differences, and conclusions. Differences in intelligence are described in Chapter Three, and differences in achievement in mathematics, science and social studies in Chapter Four. Achievement in the communication skills is discussed in Chatper Five.

The miscellany of pupil characteristics which comprise Chapter Six are related to personality and behavioral factors, stammering, enuresis, and impaired vision and hearing. The study is completed with a summary chapter which lists the findings and conclusions.

CHAPTER THREE

INTELLIGENCE

Even as late as the end of the nineteenth century there was little questioning of the widely held assumption that the mental processes of the sexes differed both in quality and quantity. With increased emphasis on scientific investigation and the refinement of measuring instruments, this assumption gradually became invalidated by the weight of contradictory evidence. Many of the earlier studies, as well as a large proportion of the more recent ones, failed to provide any clear-cut evidence of sex superiority in mental ability; yet there is a sufficient number reporting significant differences favoring one or the other of the sexes to leave room for doubt. The lack of agreement is due, in part, to the difficulties involved in interpreting findings.

Anastasi (1958) draws particular attention to these difficulties; so also do Terman (1925) and Ellis (1942). It is not easy to select a sufficiently large number of subjects without the selection being influenced by factors affecting intelligence. Most of the data on sex differences are obtained from test results of school children. Samples of school children are never strictly random in that factors affecting school enrolment may operate differentially for the sexes. There is selection when the child enters school, and a continual withdrawal of those who, through lack of ability, are unable to keep up (Cronbach, 1949). As the children progress through the grades the greater incidence of withdrawal among the boys (Douglas and Olson, 1938; Carter, 1952; Penty, 1956) tends to raise their level of ability relative to that of the girls. By the time the secondary grades are reached boys and girls do not rep-

resent comparable samples. Since there are fewer withdrawals in the elementary grades, samples of younger boys and girls tend to have greater comparability.

Another difficulty that besets workers when they attempt to compare the sexes lies in the sex-biased items that go to make up the test. In the better tests attempts are made to minimize sex differences. In this effort test makers succeed to a certain degree, but sex-biased items do remain. While some of these items tend to cancel one another, the remaining ones create a difficulty in comparing and interpreting the test results (Anastasi, 1958; Kuznets and McNemar, 1940; Scheinfeld, 1943). The makers of the tests must either admit that differences between the sexes actually exist with respect to these items or attribute the differences to bias in the sampling of the items or of the populations (McNemar, 1942). They appear to prefer the latter lest an acknowledged difference in quality of intelligence be misconstrued as a difference in quantity (Brown and Bryan, 1957). From his examination of the 1937 revision of the Stanford Binet Scale, McNemar (1942) concluded that sex differences shown by intelligence tests are more likely to be a function of the content of the items rather than of any basic abilities called forth by the items themselves.

The inability of the general group test of intelligence to discriminate between verbal and numerical ability creates another problem that interferes with the interpretation of test scores. Tests of general intelligence are composed mainly of verbal and arithmetical items. Anastasi (1958) notes that if these items are equally distributed

within the test, and if girls excel in verbal aptitude and boys in numerical, a total score need not show any significant sex differences. The extent, then, to which a test favors one or the other of these areas might well determine the sex which will show the higher intelligence.

The difficulty of arriving at valid conclusions from sex comparisons is stated forcefully by Freeman and Miles (1950) in their summary of the research. They hold that if comparisons of sex groups are to be valid, the groups must have equal heredity and equal environments. Notwithstanding efforts to obtain such equality, these authors contend that neither condition is attainable in sex comparisons. There is not equal heredity, they maintain, because the sexes differ biologically from conception; nor are there equal environments because the individual from birth is nurtured through education and experience in either the male or the female tradition.

It is apparent from the foregoing that interpretations of the findings of research on sex differences must necessarily be stated in general and relatively inconclusive terms. This does not imply that there is no agreement, nor that no definite conclusions have been reached. The studies which follow point to the generally accepted conclusion that neither sex is superior in general intelligence.

Related Studies

One of the more comprehensive groups of studies of sex differences in intelligence was that carried out by the Scottish Council for Research in Education and reported on in 1933, 1939 and 1949. The first study (1933) tested all children born in Scotland in 1921, except the

blind and the deaf. A Mental Survey Group Test was used yielding 87,498 I.Q.'s. The mean I.Q. difference between the boys and girls was not significant. A subsample of five hundred of each sex was also administered the 1916 Stanford Binet Scale. Again, the mean difference in test scores was not significant.

The sample for the 1939 survey was obtained by selecting all children born on each of four dates in 1926. It included 444 boys and 430 girls ranging in age from eight years eleven months to eleven years nine months. The mean Stanford Binet (1916) I.Q. for all the children was 100.11. The girls were just slightly below and the boys slightly above this mean. No significant sex differences were reported.

The 1,200 boys and girls tested during the third Scottish survey in 1949 were all born on six specially selected days in 1936. The 1937 revision of the Stanford Binet Scale yielded a significant difference of 3.6 I.Q. points favoring the boys. The children were also given a group test of intelligence. In this the findings were reversed. Although the girls scored 1.74 I.Q. points more than the boys the difference was not significant. Commenting on the apparent discrepancy between the conclusions arising from the 1933 and 1939 surveys and the findings of the 1949 survey, Anastasi (1958) suggested that the discrepancy might have been due to fewer boys with low scores and more girls with physical handicaps in the latter sample. She did not comment on the superiority of the girls on the group test. An implication is that the direction and magnitude of sex differences depend primarily on the test used. The Scottish studies do not provide any conclusive evidence of sex superiority in intelligence of eight to eleven year old children in Scotland.

Investigations of the normative sample of the 1937 Stanford Binet Scale also indicate that boys and girls make relatively equal scores (McNemar, 1942), although there are sex-biased items at various age levels. According to Brown and Bryan (1957) these give the boys a two point superiority in I.Q. between the ages of six and thirteen, and a four point advantage above age fourteen. The test authors (Terman and Merrill, 1937), however, maintain that the bias is due to sampling errors and not to any innate difference in ability to cope with the test items. Reporting on his work with a thousand gifted children, Terman (1925) felt that, age for age and grade for grade, the girls did as well as the boys on the Stanford Binet Scale. This was with reference to the 1916 revision in which no attempt had been made to minimize sex differences in the selection of test items.

Reports of studies made on the Wechsler Intelligence Scale for Children and on the Wechsler-Bellevue Intelligence Scale for Adults indicate sex differences in all three scores. Seashore, Wesman and Doppelt (1950) found that girls excelled the boys at ages five, six, seven and nine on all three I.Q. scores. The boys scored higher at age eight and from ten to fifteen years. Brown and Bryan (1957) held that these differences were statistically significant. They also showed that women tend to have higher mean total scores at almost every age level on the Wechsler-Bellevue. Wechsler (1944) insisted that the differences were not significant. To complicate matters, using Wechsler's test and working with psychiatric patients, Strange and Palmer (1953) and Goolishan and Foster (1954) obtained significant differences favoring the men on the three I.Q. scores and on the majority of the subtests. Contradictory findings of this nature make it extremely difficult to draw

conclusions regarding the relative abilities of the sexes.

Clark (1959) reported on a comprehensive statistical study made on seventy-five boys and seventy-five girls in each of grades three, five and eight. He obtained his random sample from test results on the California Test of Mental Maturity and the California Achievement Tests which had been administered to 69,354 pupils in 341 schools in forty-eight states. The final sample for the two sexes was selected from different schools in order to eliminate bias resulting from a single school community. In testing for differences in mental ability between the boys and girls, chronological age was held constant at each grade level.

The five test areas of the mental test yielded twenty-four differences. Of these, only three were found to be significant, all in grade three and all favoring the boys. Clark concluded that intelligence, to the extent that the California Test of Mental Maturity measured it, is independent of sex, and that where individuals perform differently on tests of mental ability the differences should therefore be interpreted in terms of individual differences rather than in terms of sex differences.

Dunlop (1947) compared test results of 5,068 boys and 4,888 girls in grade four over a period of ten years in the Ottawa school system. The National Intelligence Test had been used in these schools for eight years and the Dominion Group Intelligence Test for two. She reported that the girls excelled the boys by a reliable difference. Kuznets and McNemar (1940) point out, however, that the National Intelligence Test tends to favor the girls. When Dunlop made comparisons by age rather than by grade, the difference shifted in favor of the boys, although it was not regarded as significant. It was noted that more boys than girls

were retarded by grade, thus possibly accounting for the shift in superiority.

Results of findings tend to remain inconclusive regardless of the period in which the investigations were made. Stagner and Karwoski (1952) and Pressey (1918) reported differences favoring the girls; Book and Meadows (1928) had the boys making significantly higher scores; while Roberts (1954) and Morgan (1956) found only small and unreliable differences. On non-verbal tests, Goodenough (1926), working with 1,600 subjects ranging in age from six to eleven, reported the girls to be significantly superior at each age level on her Draw-A-Man Test. Pintner (1924), Lincoln (1927), and Newland and Lawrence (1953) found no significant differences.

The foregoing studies do not provide any justifiable basis for assuming that either sex is superior to the other in general intelligence. Terman and Tyler's (1954) survey of the literature led them to conclude that if there is a difference between the sexes in general intelligence it cannot be identified by means of our present tests. Some types of problems favor males, others favor females, and there is no satisfactory way to decide which ones constitute more valid indicators of general mental ability. This appears to be the consensus at the present time.

Explorations of sex differences in special abilities, however, have proven more fruitful than the search for differences in general mental ability. Studies indicate a consistent difference favoring the girls in verbal ability (Tyler, 1956). From infancy to adulthood, females express themselves in words more readily and skillfully than males (McCarthy, 1954). This superiority in verbal ability, however,

appears to be more in word fluency, Thurstone's W, than in a grasp of verbal meanings (V). According to Hobson (1947) and Havighurst and Breese (1947), as a result of their work with junior high school students, girls obtained significantly higher scores on tests involving W, but not on V of the Primary Mental Abilities battery. In fact, Hobson's study gave the boys higher scores on V. Herzberg and Lapkin (1954) also found senior high school girls to be significantly higher on tests involving W. When these findings are related to those of Goodenough (1927) that girls learn to talk earlier than boys, and to the findings of Wellman et al. (1931) that girls are somewhat superior during the preschool years in articulation, intelligibility and correctness of speech and are less likely to be stutterers, the conclusion is readily reached that girls are more fluent than boys and excel in tests involving verbal abilities almost from infancy on.

Males, however, excel in mathematical ability (Terman and Tyler, 1954), but their superiority shows up more in tests of reasoning than in tests of computation. At the lower age levels where number tests involve simple counting and identification, and at all ages where only mechanical arithmetic is involved, differences seldom appear (Tyler, 1956), and if they do they tend to favor the girls (Terman and Tyler, 1954). Even in abilities involving N, the mere manipulation of numbers, males do not excel in the junior high school (Hobson, 1947; Havighurst and Breese, 1947); it is in solving problems and in quantitative thinking at this level that boys are more successful than girls. Sweeney (1953) has shown, too, that males at the college level are more successful than girls in problem solving in general, particularly in those types of problems

requiring a reorganization of the facts in order to make a new start toward their solution.

In summary, while the evidence is too inconclusive and inconsistent to infer the superiority of one sex over the other in general intelligence, research points to clear-cut sex differences in tests involving verbal ability and quantitative thinking.

The extent to which the sexes exhibit a greater dispersion of scores on intelligence and achievement tests has been seriously debated for many years. The excess of men in the lists of eminent persons in any country and the fact that more males than females are usually reported in statistical surveys of mental deficiency have led to the hypothesis of greater male variability in mental traits (Terman and Tyler, 1954). Surveys to identify gifted children in the school population relate conflicting findings, due possibly to differences in bases of selection. Terman (1925) examined 16,800 children in grades three to eight in his search for pupils of I.Q. of 140 and over. He found a ratio of six to five in favor of the boys. He also found twice as many boys as girls with I.Q.'s over 140 in the high school population at large. Terman's preliminary selection was based on teacher judgment; thus a sex bias may have resulted through nomination by women teachers in the elementary grades, and by the selective factor of boys with higher ability in the high school. Through testing the entire Kansas City school population from grades three to seven, Witty (1940) located twenty-four boys and twenty-six girls with I.Q.'s of 140 or more. One of the largest surveys on the distribution of intelligence among school children was that of Lewis (1945) in which he took the top

and bottom ten per cent of over 45,000 grades four to eight children. In the upper ten per cent he obtained a ratio of 146 girls to 100 boys, and in the lower, 186 boys to 100 girls. Lewis, however, used the Kuhlman-Anderson intelligence test which has a sex bias in favor of the girls (Terman and Tyler, 1954). It is highly possible that differences in bases of selection by research workers account for the discrepancies in the ratio of males to females at the upper intellectual levels.

In school surveys in Canada, it is noted that more boys than girls are enrolled in special classes for the slow learner; and studies of mental institutions report more males institutionalized because of mental deficiency (Wright, 1956). It must be kept in mind, however, that boys do not adjust to the school situation as readily as girls, and that mental defective males become less manageable than females.

Dissimilar results have also come from general surveys of school populations in attempts to determine the relative variability in intelligence of the sexes. Riggs (1940) discovered no reliable sex differences in variability in his comparison of 5,069 boys and 5,010 girls in grades three to eight, although Dunlop (1947) found greater variability among grade four boys in her ten year study in the Ottawa schools. McNemar and Terman (1936) made an extensive survey of the most reliable and objective data available on sex variability in intelligence and achievement test scores. While the results for achievement were inconsistent, they provided evidence favoring greater male variability. Sex comparisons of the scores of the mental tests examined in the study gave more conclusive results. Thirty-three mental tests were compared

for sex differences in variability and of these, twenty-nine yielded statistically reliable differences indicative of greater variability in intelligence test scores among males.

Data from the three Scottish Surveys of 1933, 1939 and 1949, also included information on variability. In view of the comparatively large numbers of subjects involved, Terman and Tyler (1954) have suggested that possibly some of the best data on variability come from this source. The first survey, using a group mental test, showed the test scores of the boys to be significantly more variable at the one per cent level of confidence. Although the 1939 survey did not reveal statistically significant differences, the consistency with which the boys' scores on the intelligence test showed a wider spread was interpreted as evidence of greater variability in the male. The third survey in 1949 gave slightly higher standard deviations for the girls on the 1937 Stanford Binet Scale, but greater deviations for the boys on the group mental test administered at the same time. In neither case was the difference significant.

The evidence favoring greater variability in intelligence test scores of either sex is inconclusive. A review of the literature led Terman and Tyler (1954) and Anastasi (1958) to conclude that the answer to sex variability in intelligence appears to depend on the nature of the test used, on factors of motivation, and on cultural tradition. The general consensus is that differences in variability of intelligence test scores are too slight to be of much significance and that there is not adequate evidence to state categorically that one sex is more variable.

The Clover Bar Data

Intellectual measurements were obtained for 1,441 boys and 1,358 girls regularly enrolled in grades one through twelve in the public schools of the Clover Bar School Division. The appropriate forms of the Otis Quick Scoring Tests of Mental Ability and of the Cooperative School and College Ability Tests furnished the scores. The Otis provided a non-verbal, verbal and total raw score as well as an I.Q. for each pupil in the first three grades, and a raw score and I.Q. for the pupils in grades four to twelve. The Cooperative School and College Ability Tests series was also administered to the pupils in grades four to twelve giving three scores, verbal, quantitative and total. Sex comparisons were made by testing for significant differences between means and variances for each set of test scores in each grade. The means and standard deviations expressed in stanine scores and levels of significance are shown in Tables II to XIII.

The data from Table II indicate that the boys and girls in grade one performed about equally well on the various phases of the Otis. No significant sex differences between mean scores or standard deviations were revealed. That is, all differences were non-significant and could have arisen as a result of chance.

TABLE II.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE OTIS QUICK SCORING TEST OF MENTAL ABILITY, ALPHA FORM, GRADE ONE

	Non-verbal Raw Score.	Verbal Raw Score	Total Raw Score	Otis I.Q.
N Boys	173	172	173	173
Girls	181	185	184	183
Mean Boys	4.97	5.03	4.98	4.91
Girls	5.03	4.99	4.98	5.07
S.D. Boys	1.97	1.92	1.96	1.93
Girls	1.82	1.91	1.93	1.94
t	.30	.20	.00	.78
Sig. t[a]				
F	1.17	1.01	1.03	1.01
Sig. F[a]				

[a] Significance is stated only when the difference attains the .05 (or better) level of confidence.

TABLE III.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE OTIS QUICK SCORING TEST OF MENTAL ABILITY, ALPHA FORM, GRADE TWO

	Non-verbal Raw Score	Verbal Raw Score	Total Raw Score	Otis I.Q.
N Boys	167	166	167	166
Girls	147	147	147	147
Mean Boys	4.92	4.96	4.94	4.92
Girls	5.21	5.01	5.10	5.06
S.D. Boys	2.02	1.97	2.01	1.98
Girls	1.89	1.92	1.94	1.93
t	1.31	.23	.72	.63
Sig. t				
F	1.14	1.05	1.07	1.05
Sig. F				

No significant differences between the sexes in either the means or the standard deviations were revealed in the grade two data (Table III), although trends favored the girls. The boys' scores exhibited a greater variability in all four sets of scores, but again the differences were not significant.

The results for grade three (Table IV) were similar to those of the first two grades. There were no significant mean differences favoring either sex, although the girls continued to obtain slightly higher scores. No significant differences in variability of the test scores were revealed by the data.

TABLE IV.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE OTIS QUICK SCORING TEST OF MENTAL ABILITY, ALPHA FORM, GRADE THREE

		Non-verbal Raw Score	Verbal Raw Score	Total Raw Score	Otis I.Q.
N	Boys	151	151	151	151
	Girls	120	119	120	120
Mean	Boys	4.92	5.15	4.98	4.95
	Girls	5.08	5.08	5.06	5.11
S.D.	Boys	2.05	1.96	1.95	2.02
	Girls	1.91	2.04	1.98	1.89
t		.66	.28	.33	.67
Sig. t					
F		1.15	1.09	1.03	1.15
Sig. F					

A summary of the three tables reveals that the boys exceeded the girls only on grade one and grade three verbal scores. The girls were superior to the boys on all non-verbal scores and in Otis I.Q. in

the first three grades. In no case did the differences attain significance at the .05 level. It must then be concluded that, for this sample of pupils in grades one, two and three, measured by the Otis test, no actual differences in verbal or non-verbal intelligence and no differences in I.Q. have been established.

In the intermediate grades, four, five and six, there are five categories of data: raw scores on the Otis, an Otis I.Q., and the Total, Verbal and Quantitative scores from the SCAT series. The grade four girls made significantly better scores on the Otis I.Q. at the .01 level of confidence and on the SCAT Verbal test at the .05 level (Table V). In grade five (Table VI) they again were significantly superior at the .01 level in Otis I.Q. and at the .05 level on SCAT Total. There were no significant differences in variability of scores in either

TABLE V.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE OTIS BETA FORM, AND ON SCAT, GRADE FOUR

		Otis Raw Score	Otis I.Q.	SCAT Verbal	SCAT Quant.	SCAT Total.
N	Boys	158	157	157	157	157
	Girls	145	142	141	141	141
Mean	Boys	4.82	4.68	4.81	4.83	4.94
	Girls	5.23	5.30	5.28	5.21	5.34
S.D.	Boys	1.88	1.89	2.05	2.08	2.01
	Girls	2.04	2.00	1.73	1.74	1.82
t		1.81	2.74	2.14	1.53	1.80
Sig. t			.01	.05		
F		1.18	1.12	1.40	1.42	1.22
Sig. F						

TABLE VI.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE OTIS BETA FORM, AND ON SCAT, GRADE FIVE

		Otis Raw Score	Otis I.Q.	SCAT Verbal	SCAT Quant.	SCAT Total
N	Boys	134	133	131	130	130
	Girls	149	149	146	146	146
Mean	Boys	4.72	4.61	4.76	4.81	4.72
	Girls	5.17	5.39	5.09	5.16	5.18
S.D.	Boys	1.96	1.91	2.06	1.91	1.93
	Girls	1.99	1.93	1.83	1.89	1.88
t		1.91	3.41	1.40	1.53	2.00
Sig. t			.01			.05
F		1.03	1.02	1.27	1.01	1.05
Sig. F						

of these grades. No grade six means and standard deviations showed significant differences (Table VII).

TABLE VII.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE OTIS BETA FORM, AND ON SCAT, GRADE SIX

		Otis Raw Score	Otis I.Q.	SCAT Verbal	SCAT Quant.	SCAT Total
N	Boys	123	123	122	122	122
	Girls	130	130	124	124	124
Mean	Boys	4.93	4.88	5.20	4.97	5.12
	Girls	5.04	5.12	4.89	5.12	5.00
S.D.	Boys	1.95	1.91	1.89	1.95	1.95
	Girls	1.98	2.06	1.90	1.87	1.98
t		.45	.96	1.28	.61	.48
Sig. t						
F		1.03	1.16	1.01	1.09	1.03
Sig. F						

A summary of the data for the intermediate grades reveals that the boys exceeded the girls only on the SCAT Verbal and SCAT Total scores in grade six. The girls were superior to the boys on all quantitative scores and in Otis I.Q. in these three grades. Significant differences at the .01 level of confidence were attained, however, only in Otis I.Q. in grades four and five; and at the .05 level on SCAT Verbal in grade four and on SCAT Total in grade five. It may be concluded for this sample of pupils, measured on the Otis and SCAT tests, that the Clover Bar girls were significantly superior to the boys in Otis I.Q. in grades four and five, in verbal intelligence in grade four, and in academic aptitude (SCAT Total) in grade five.

The data in Table VIII point to a marked superiority at the .01 level of significance for the grade seven girls in all tests except

TABLE VIII.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE OTIS BETA FORM, AND ON SCAT, GRADE SEVEN

	Otis Raw Score	Otis I.Q.	SCAT Verbal	SCAT Quant.	SCAT Total
N Boys Girls	123 108	123 108	122 105	122 104	122 107
Mean Boys Girls	4.58 5.53	4.49 5.50	4.77 5.26	4.65 5.30	4.60 5.35
S.D. Boys Girls	1.93 1.89	1.91 1.87	1.92 1.95	1.91 1.83	1.95 2.00
t	3.77	4.05	1.90	2.61	2.85
Sig. t	.01	.01		.01	.01
F	1.05	1.04	1.03	1.08	1.05
Sig. F					

in the verbal subtest of SCAT. There was no significant difference in the spread of test scores in this grade. The grade eight scores (Table IX) showed only small differences in means and standard deviations. It is a point of interest to note that, for the first time in any grade, the girls in grade eight showed a wider range of scores than the boys in all tests. The means of the grade nine boys exceeded those of the girls on all test scores. The difference attained significance, however, only on SCAT Total at the .05 level (Table X). The boys' scores in this grade tended to have greater variability than the girls' except in SCAT Total scores; the differences, however, were all non-significant.

TABLE IX

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE OTIS BETA FORM, AND ON SCAT, GRADE EIGHT

		Otis Raw Score	Otis I.Q.	SCAT Verbal	SCAT Quant.	SCAT Total
N	Boys	123	123	124	124	124
	Girls	99	99	102	102	102
Mean	Boys	5.06	4.96	4.92	5.12	5.06
	Girls	5.07	4.97	5.12	4.84	4.93
S.D.	Boys	1.86	1.89	1.91	1.98	1.85
	Girls	2.10	2.11	2.02	2.00	2.07
t		.04	.04	.76	1.05	.49
Sig. t						
F		1.26	1.25	1.13	1.02	1.24
Sig. F						

TABLE X.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE OTIS GAMMA FORM, AND ON SCAT, GRADE NINE

		Otis Raw Score	Otis I.Q.	SCAT Verbal	SCAT Quant.	SCAT Total
N	Boys	95	98	97	97	97
	Girls	104	106	104	104	104
Mean	Boys	5.18	5.07	5.21	5.24	5.29
	Girls	4.79	4.97	4.87	4.74	4.73
S.D.	Boys	1.95	2.11	1.99	1.97	1.83
	Girls	1.94	1.87	1.96	1.79	2.01
t		1.41	.36	1.23	1.89	2.07
Sig. t						.05
F		1.01	1.27	1.03	1.08	1.21
Sig. F						

The tabulated mental test scores for the junior high school grades reveal that the grade seven girls were significantly superior to the boys on the quantitative and Otis scores, and markedly superior, but not significantly so, on the verbal scores. The data also suggest that the trend of differences favored the grade nine boys on all verbal, quantitative and Otis scores, but significance was attained only on SCAT Total score. In grade eight, the girls obtained higher scores on the Otis and verbal tests, the boys on the quantitative and total scores of SCAT, but no differences attained significance. It may be concluded therefore, that there is evidence of real differences in mental ability between the boys and girls in grades seven and nine, as measured by the Otis and SCAT tests. The grade seven girls were superior in quantitative intelligence and Otis I.Q.; the grade nine boys excelled in academic aptitude.

No significant differences in means were noted in the three

grades of the senior high school (Tables XI, XII and XIII). The boys in all grades again tended to have a wider range of scores, but all differences in spread were non-significant. The small non-significant differences in mean Otis I.Q. favored the girls in all three grades. The girls also obtained slightly higher scores on SCAT Verbal in grades ten and eleven, and on both SCAT Quantitative and SCAT Total in grade eleven. The boys, however, obtained the higher scores on SCAT Verbal in grade eleven as well as on SCAT Quantitative and SCAT Total in both ten and twelve.

TABLE XI.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE OTIS GAMMA FORM, AND ON SCAT, GRADE TEN

	Otis Raw Score	Otis I.Q.	SCAT Verbal	SCAT Quant.	SCAT Total
N Boys	72	73	70	70	70
Girls	75	77	74	74	74
Mean Boys	4.99	5.03	5.00	5.24	5.00
Girls	4.99	5.09	5.16	4.84	4.99
S.D. Boys	1.94	1.88	2.01	2.13	2.12
Girls	2.00	2.07	1.77	1.72	1.84
t	.00	.19	.50	1.23	.03
Sig. t					
F	1.06	1.21	1.29	1.52	1.33
Sig. F					

Since no mean differences were significant, even at the .05 level of confidence, it may be assumed that no actual differences in verbal or quantitative intelligence and no differences in I.Q. exist for this sample of students in grades ten, eleven and twelve, measured

TABLE XII.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE OTIS GAMMA FORM, AND ON SCAT, GRADE ELEVEN

		Otis Raw Score	Otis I.Q.	SCAT Verbal	SCAT Quant.	SCAT Total
N	Boys	57	59	56	53	56
	Girls	42	43	41	39	41
Mean	Boys	4.96	4.93	4.96	4.66	4.96
	Girls	5.12	5.16	4.95	5.05	5.10
S.D.	Boys	2.02	2.02	1.96	2.00	2.02
	Girls	1.97	1.97	1.96	1.54	1.84
t		.40	.58	.02	1.06	.36
Sig. t						
F		1.05	1.05	1.00	1.69	1.20
Sig. F						

by the Otis and SCAT Tests.

In summary, for the twelve grades, it may be noted that the

TABLE XIII.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE OTIS GAMMA FORM, AND ON SCAT, GRADE TWELVE.

		Otis Raw Score	Otis I.Q.	SCAT Verbal	SCAT Quant.	SCAT Total
N	Boys	40	42	40	40	40
	Girls	28	30	28	28	28
Mean	Boys	4.98	4.98	5.10	5.15	5.10
	Girls	5.18	5.17	5.14	4.64	4.89
S.D.	Boys	2.10	2.05	2.00	2.20	1.96
	Girls	1.79	1.88	2.00	1.69	1.95
t		.42	.41	.08	1.08	.44
Sig. t						
F		1.36	1.19	1.00	1.69	1.01
Sig. F						

Otis I.Q. scores revealed that the girls exceeded the boys in all grades except grade nine. Non-significantly higher mean scores for the girls appeared in grades one to three. They had significantly superior scores in grades four, five and seven, but the differences reverted to non-significance again in grades ten, eleven and twelve. A pattern of female superiority also appeared to delvelop in the Otis non-verbal and SCAT Quantitative scores in grades one to seven. Similar patterns, but less evident, emerged in the SCAT Verbal and SCAT Total scores. An indication of a definite male superiority occurred only in grade nine where the boys obtained higher mean scores on all five ratings, attaining significance, however, only on the SCAT Total score.

The five scores which contributed to the intelligence test data for the Clover Bar students showed a leaning toward female superiority which was most noticeable in the elementary and junior high school grades. In only six instances of the thirty-seven differences in mean scores in grades one to eight did the boys obtain higher scores, and none of them was significant. The ratio of greater mean differences in the senior high school grades was nine to five favoring the girls, and again none was significant. This general tendency toward a female superiority in mental ability does not support the first hypothesis of this study relating to sex differences in general intelligence, nor is it in agreement with the general conclusion among research workers that there is no justifiable basis for assuming the intellectual superiority of either sex. Differences reported in related studies were, for the most part, attributed to biases in the population samples or in the test items, or to factors contributing to less than optimum performance by the subjects involved.

The Clover Bar population, while consisting of a relatively large sample of children, especially in the elementary and junior high school grades, was not a random sampling of the general school population. Presently unknown and uncontrolled variables could have accounted for the superiority of either sex on any of the subtests in any of the grades.

The normative sample of the SCAT series of tests indicates that, for the three subtests, Total, Verbal and Quantitative, the means of the girls in grades four to nine either equal or exceed the means of the boys (Test Manual, 1957). The boys' means are generally higher in grades ten, eleven and twelve. The authors do not state if any of the mean differences are significant. The consistency of the girls' higher means, even if not significant, tends to suggest a bias in favor of the girls, especially in the lower grades. Sex bias of test items could possibly be a factor contributing to the higher test scores of the girls.

The selective factor of intelligence related to decreased enrolment may also be a factor influencing apparent superior ability. Generally, in the Clover Bar schools, the fluctuation in enrolment showed a greater decrease in the number of girls than in the number of boys (Table I). This is contradictory to the reports of investigations of school dropouts. If it is assumed that a fairly large proportion of the children who leave school do so because of lower ability, then the general level of ability of those remaining will be raised. Possibly little significance can be attached to a single observation of enrolment fluctuating between successive grades, nevertheless the factor of decreased enrolment is of considerable importance and may have contributed to the sex superiority indicated in the Clover Bar data.

Because of the possible influence of a non-random population, or of biased test items, or of selective factors of reduced enrolment, or of other causes, it cannot be stated categorically that there is a real difference in general intelligence between the Clover Bar boys and girls. Nevertheless, a difference in test results exists. It would be of interest to ascertain if this were a true difference in intellectual ability for this particular population or if it were due mainly to the influence of chance factors.

Patterns of Sex Differences

A closer examination of Tables II to XIII in conjunction with Figures 1 to 5 provides further insight into the nature of the sex differences in mental ability of the Clover Bar boys and girls. The mean scores, in stanines, obtained by the sexes on the Otis and SCAT tests are shown graphically by grade in Figures 1 to 5. Otis I.Q.'s for grades one to twelve are graphed in Figure 1. Figure 2 compares the verbal, non-verbal and total Otis raw scores for the primary grades, while SCAT Verbal, Quantitative and Total scores are represented graphically in Figures 3, 4 and 5 respectively. Grades in which significant differences occur are indicated by red circles on the graphs. The conclusions to be drawn from each figure follow.

Figure 1. Comparison by Sex of Mean Otis I.Q. Scores, Grades One to Twelve. The girls were significantly superior in Otis I.Q. mean scores in grades four, five and seven, and almost so in grade six. This period corresponds closely with the prepuberal period in which female growth is accelerated. Prior to grade four and after grade seven the differences, while favoring the girls in all grades save nine, were non-significant.

Figure 2. Comparison by Sex of Mean Otis Raw Scores, Grades One, Two and Three. No significant differences appeared in the three sets of scores for these grades, although the girls showed a slight superiority in non-verbal and total scores.

Figure 3. Comparisons by Sex of Mean SCAT Verbal Scores, Grades Four to Twelve. The girls were significantly superior in SCAT Verbal scores in grade four. Thereafter there was no significant difference between the scores. It is to be recalled that there were no significant differences in Otis verbal scores in grades one, two and three (Fig. 2). There was no tendency for one sex to be superior in verbal mean scores for grades one to three and five to twelve.

Figure 4. Comparison by Sex of Mean SCAT Quantitative Scores, Grades Four to Twelve. The girls were significantly superior on quantitative mean scores in grade seven and somewhat superior to the boys in grades four, five and six. In grades eight, nine and ten the boys were superior, but not significantly so.

Figure 5. Comparison by Sex of Mean SCAT Total Scores, Grades Four to Twelve. On SCAT Total scores the girls were significantly superior in grades five and seven and almost so in grade four, while the boys were significantly superior in grade nine. Thereafter the differences were non-significant and tended to diminish. It will be noted that female superiority again appeared in the period of the prepuberal growth spurt as in the case of the mean Otis scores (Fig. 1).

Three patterns of sex differences in development of intelligence and academic aptitude, as measured by Otis and SCAT scores, have been

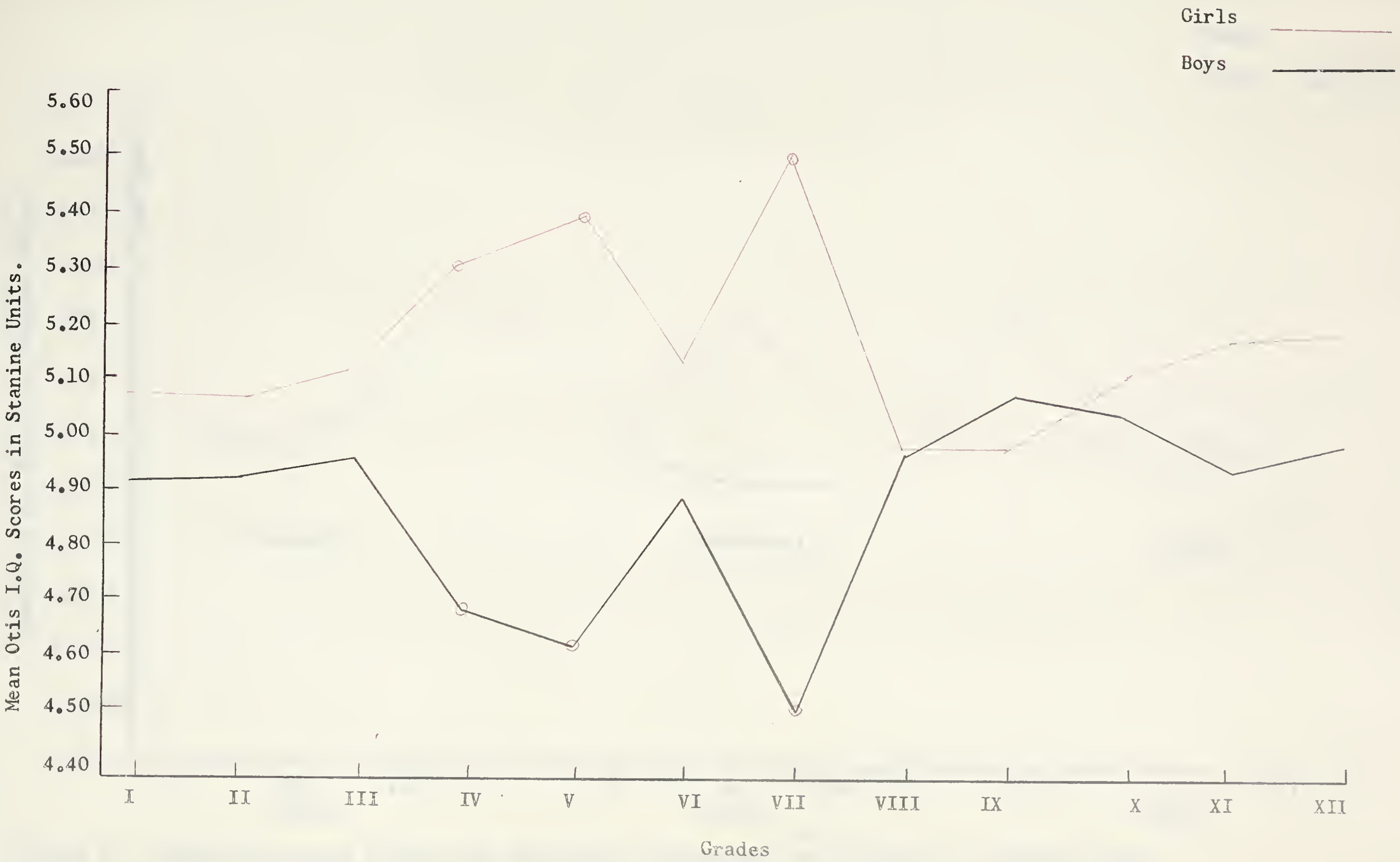

Figure 1. Comparison by Sex of Mean Otis I.Q. Scores, Grades One to Twelve, in Stanine Units.

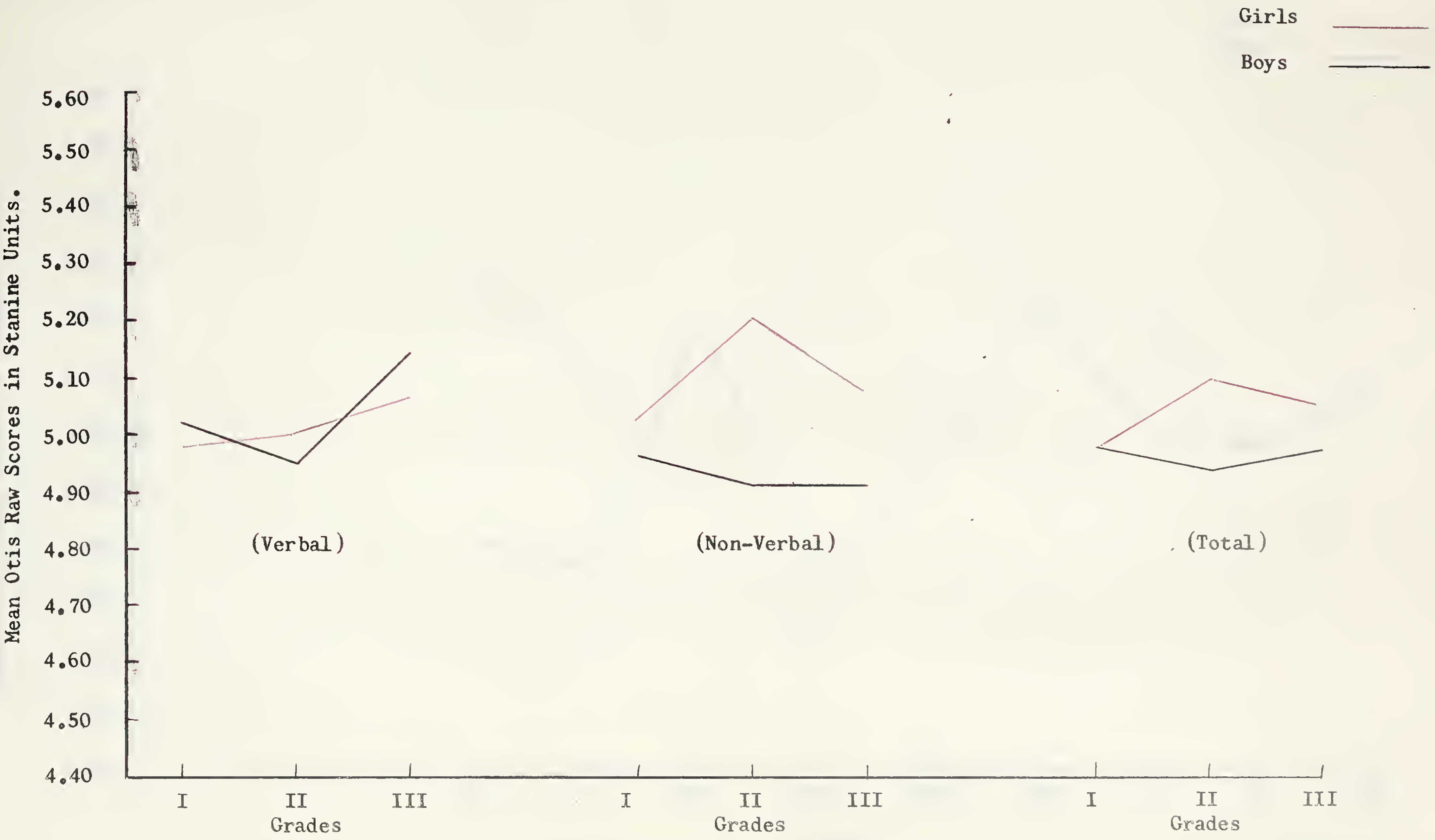

Figure 2. Comparison by Sex of Mean Otis Raw Scores, Grades One, Two and Three, in Stanine Units.

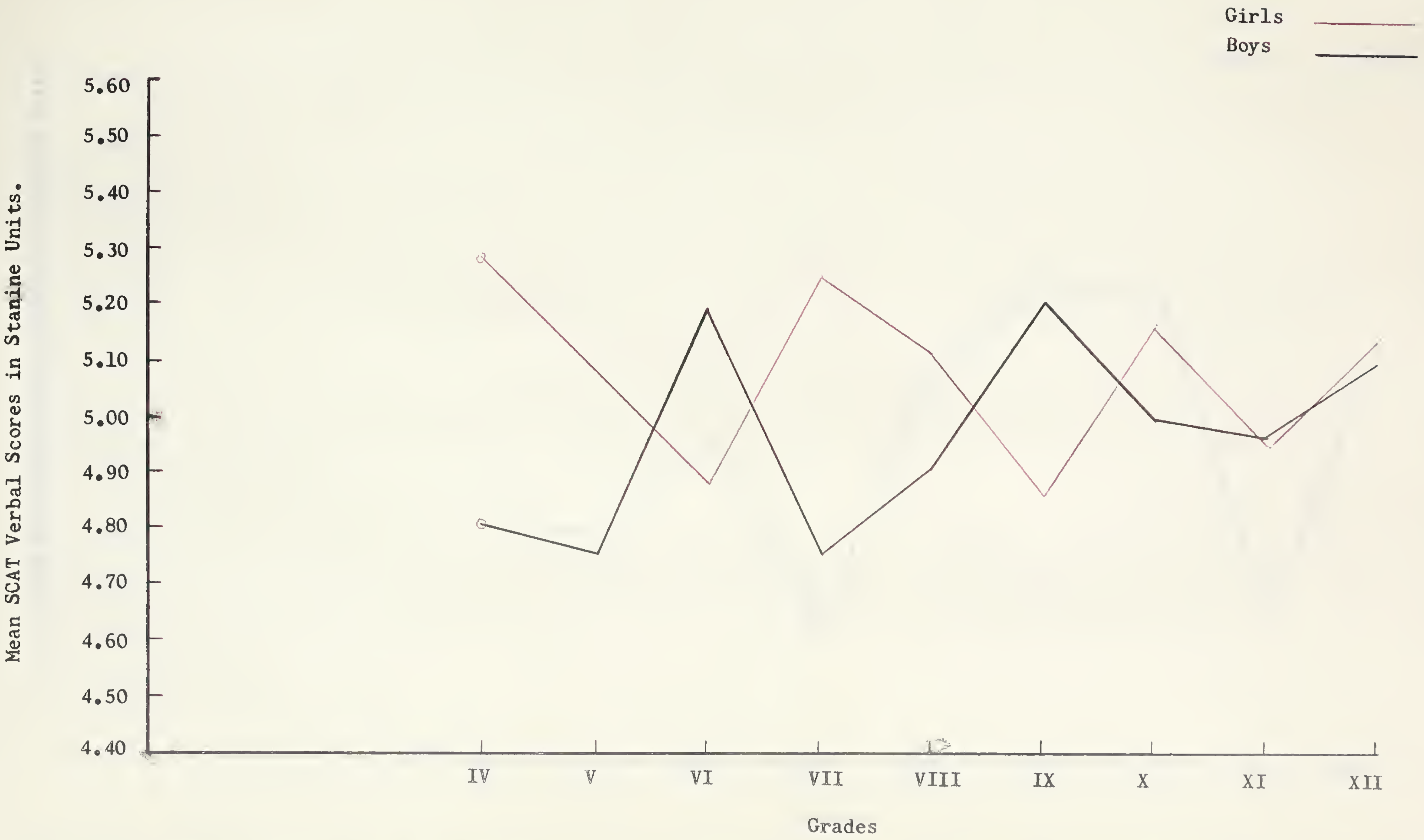

Figure 3. Comparison by Sex of Mean SCAT Verbal Scores, Grades Four to Twelve, in Stanine Units.

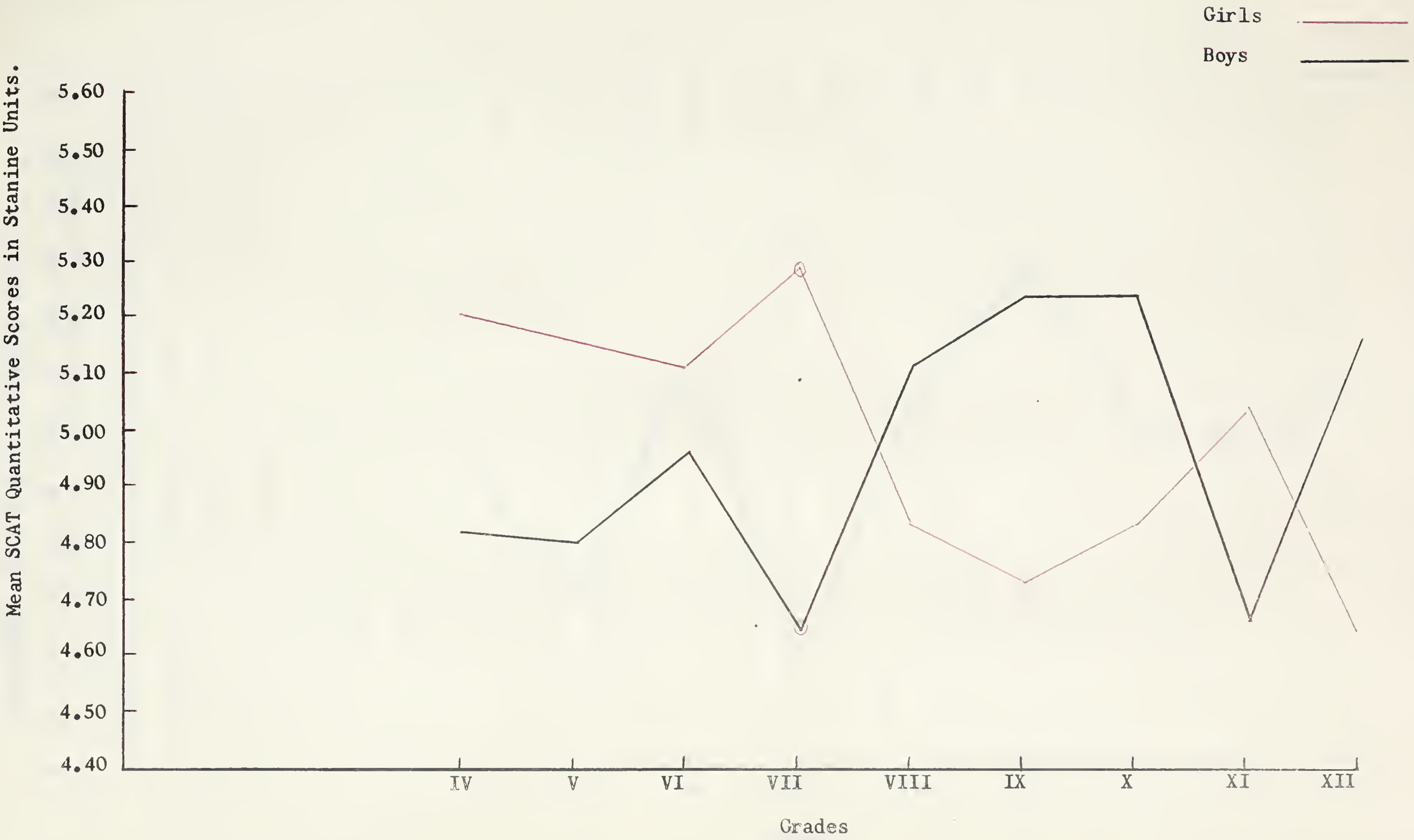

Figure 4. Comparison by Sex of Mean SCAT Quantitative Scores, Grades Four to Twelve, in Stanine Units.

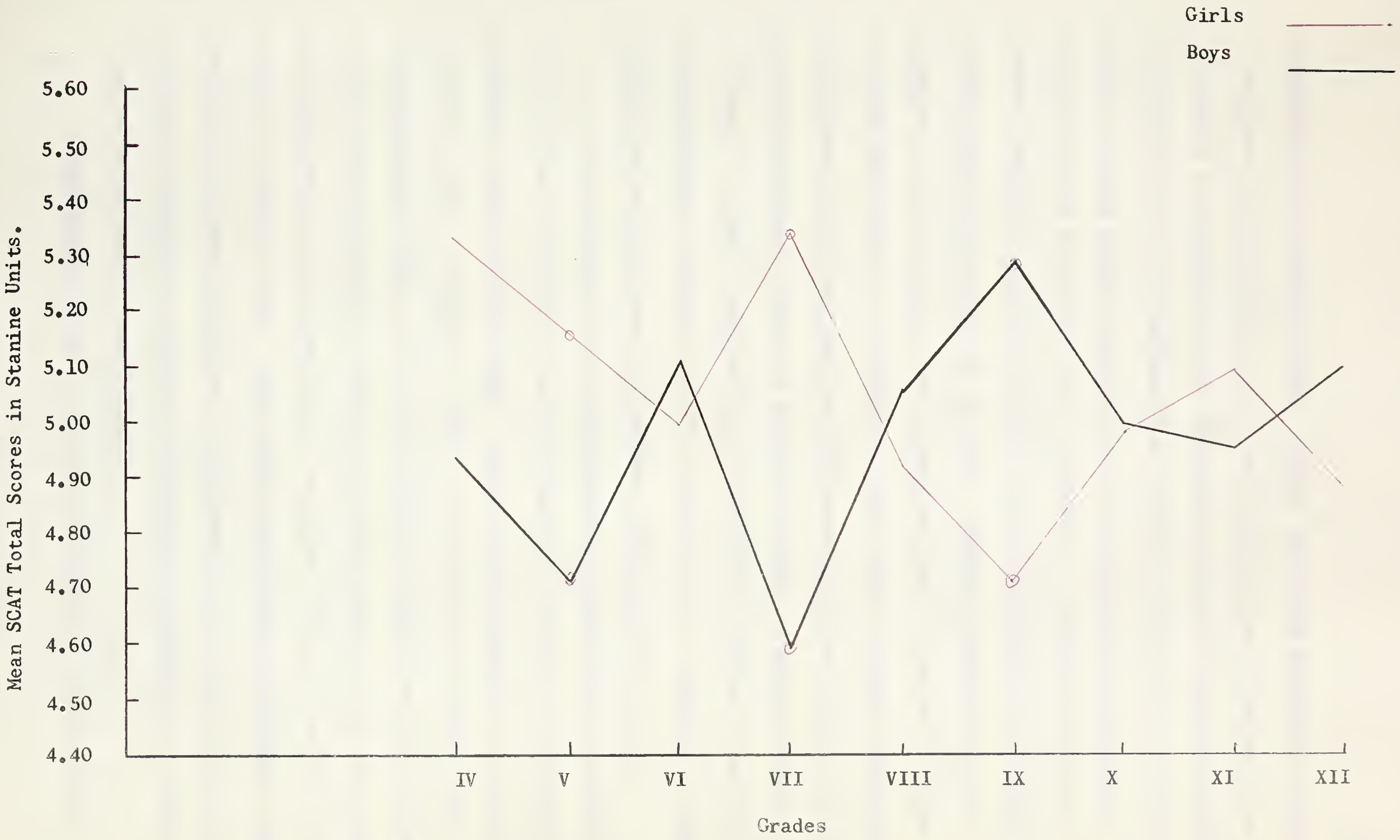

Figure 5. Comparison by Sex of Mean SCAT Total Scores, Grades Four to Twelve, in Stanine Units.

detected in the Clover Bar data. First: the girls revealed a significant superiority in Otis I.Q. scores in grades four, five and seven, and almost so in grade six, the prepuberal period of accelerated growth. The SCAT Total scores confirmed this finding in grades five and seven and to a lesser degree in grade four. While the evidence suggests a tendency toward the intellectual superiority of the girls in the prepuberal period, it does not indicate that corresponding physiological changes affect the ability of the boys. Similar findings have not appeared in other studies, thus suggesting that the present findings could be the result of a limited or biased sample. Second: there was no evidence of any consistent sex difference in verbal ability throughout any appreciable portion of the twelve grades. Third: there was evidence of a female superiority in quantitative thinking at the level of significance in grades four, five and seven. The situation in grades eight, nine and ten showed a consistent trend favoring the boys.

The evidence in the literature of a greater female superiority in general intelligence, as represented by the Otis and supported by SCAT Test scores, is not strong. This Clover Bar finding is supported by Dunlop (1947), Goodenough (1926), and the group test of the Third Scottish Survey (1949). It is not confirmed, however, by the individual test of the Third Scottish Survey, nor by the results of the first two Scottish surveys in 1933 and 1939. Nor is the finding in keeping with reports by McNemar (1942), Terman (1925), and Kuznets and McNemar (1940). And finally, Freeman and Miles' (1950) summary of the literature provides definite contradictory evidence of the Clover Bar finding of a female superiority in general intelligence.

The second pattern of no sex differences in verbal ability

that has emerged from the Clover Bar data also contradicts research findings. Female superiority in verbal ability has been noted in studies by McCarthy (1954), Terman and Tyler (1954), and by Freeman and Miles (1950). Negative support for this finding comes also from reports of male superiority in word meaning by Anastasi (1958) and Hobson (1947), and in verbal reasoning by Terman and Tyler (1954).

The third pattern of sex differences, relative to quantitative thinking, that has arisen out of the Clover Bar findings finds support for female superiority in grades four to seven by Anastasi (1958) and Terman and Tyler (1954), and to a lesser degree by Havighurst and Breese (1947)and Hobson (1947). Findings by Bennett, Seashore and Wesman (1952) and by Wesman (1949) also tend to corroborate the trend favoring the boys in quantitative thinking in grades eight, nine and ten.

Variability. Graphical comparisons of the standard deviations of the intelligence tests scores are shown in the accompanying graphs, Figures 6 to 10. No significant differences occurred in any of the five sets of scores. The finding of approximately equal variability in intelligence test scores between the sexes in the Clover Bar school population is supported by such representative studies as those of Riggs (1940) and McNemar (1942), but tends to disagree with the reports of McNemar and Terman (1936) and Dunlop (1947). The non-significant differences in the dispersion of the Clover Bar intelligence test scores, however, suggest a greater variability in the males. There is some evidence, too, of a greater though non-significant female variability in mental test scores in grades six, seven and eight, a period of prepuberal and puberal accelerated physical growth.

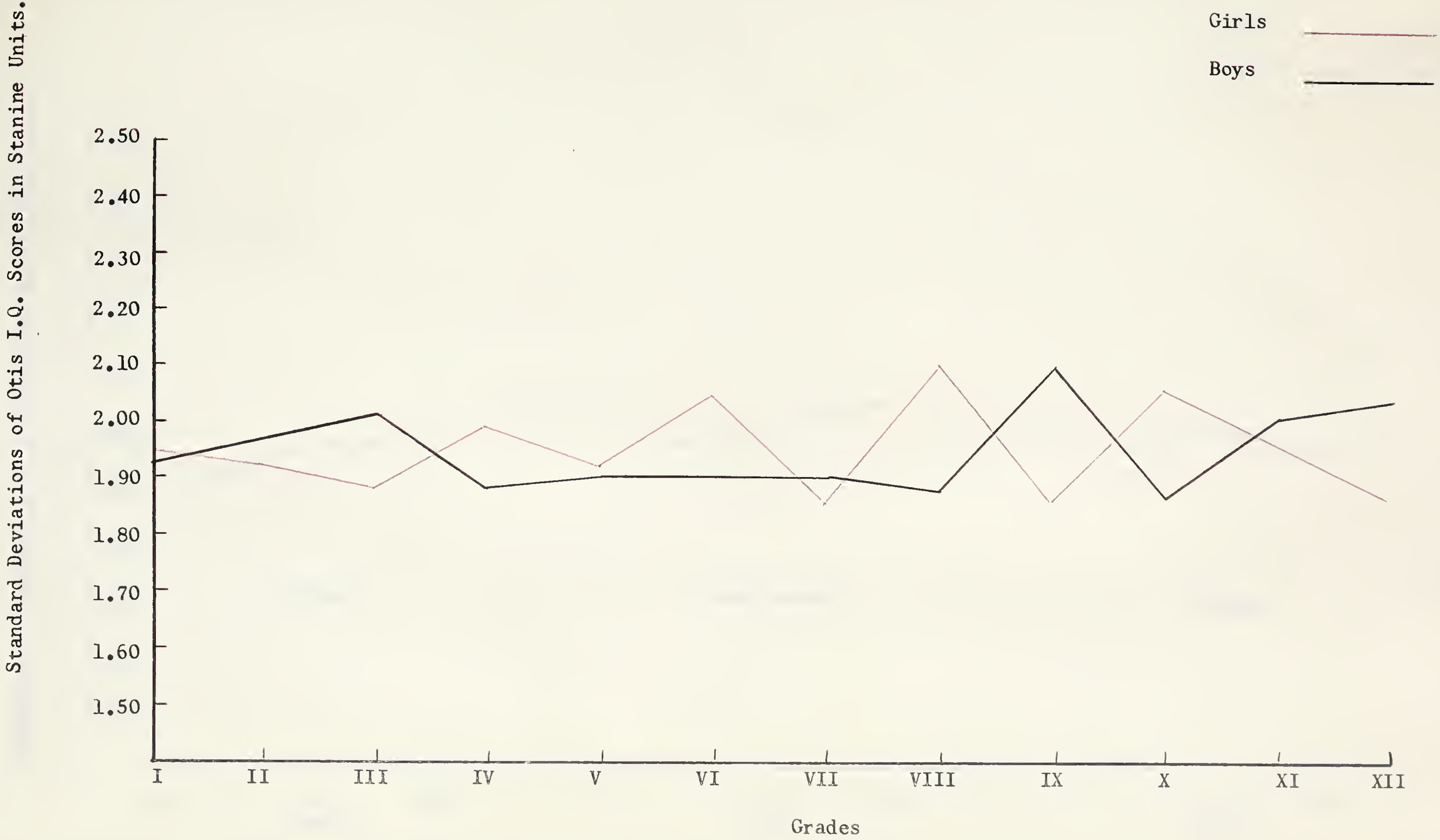

Figure 6. Comparison by Sex and Grade of Standard Deviations of Otis I.Q. Scores, in Stanine Units.

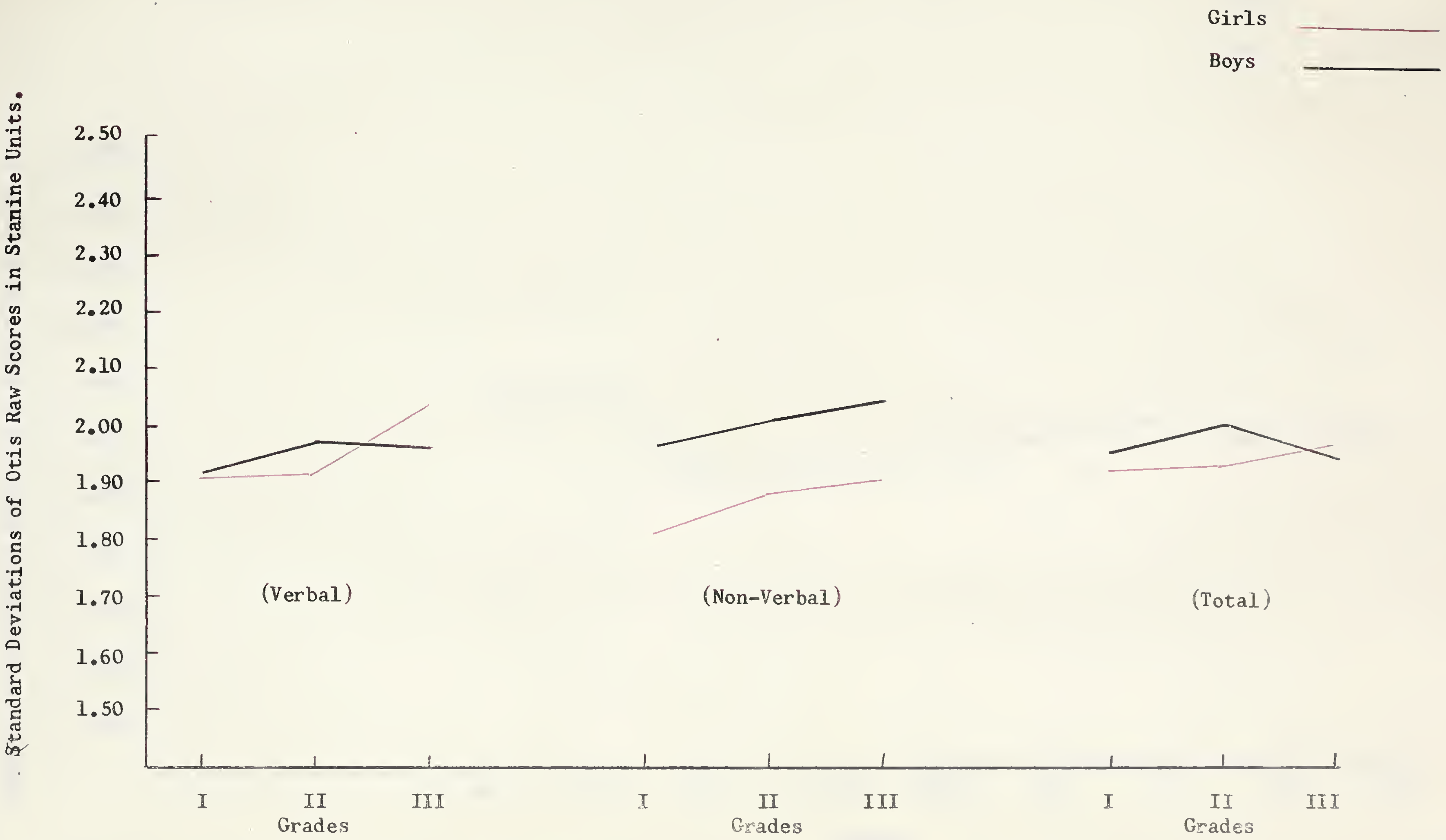

Figure 7. Comparison by Sex of Standard Deviations of Otis Raw Scores, Grades One, Two and Three, in Stanine Units.

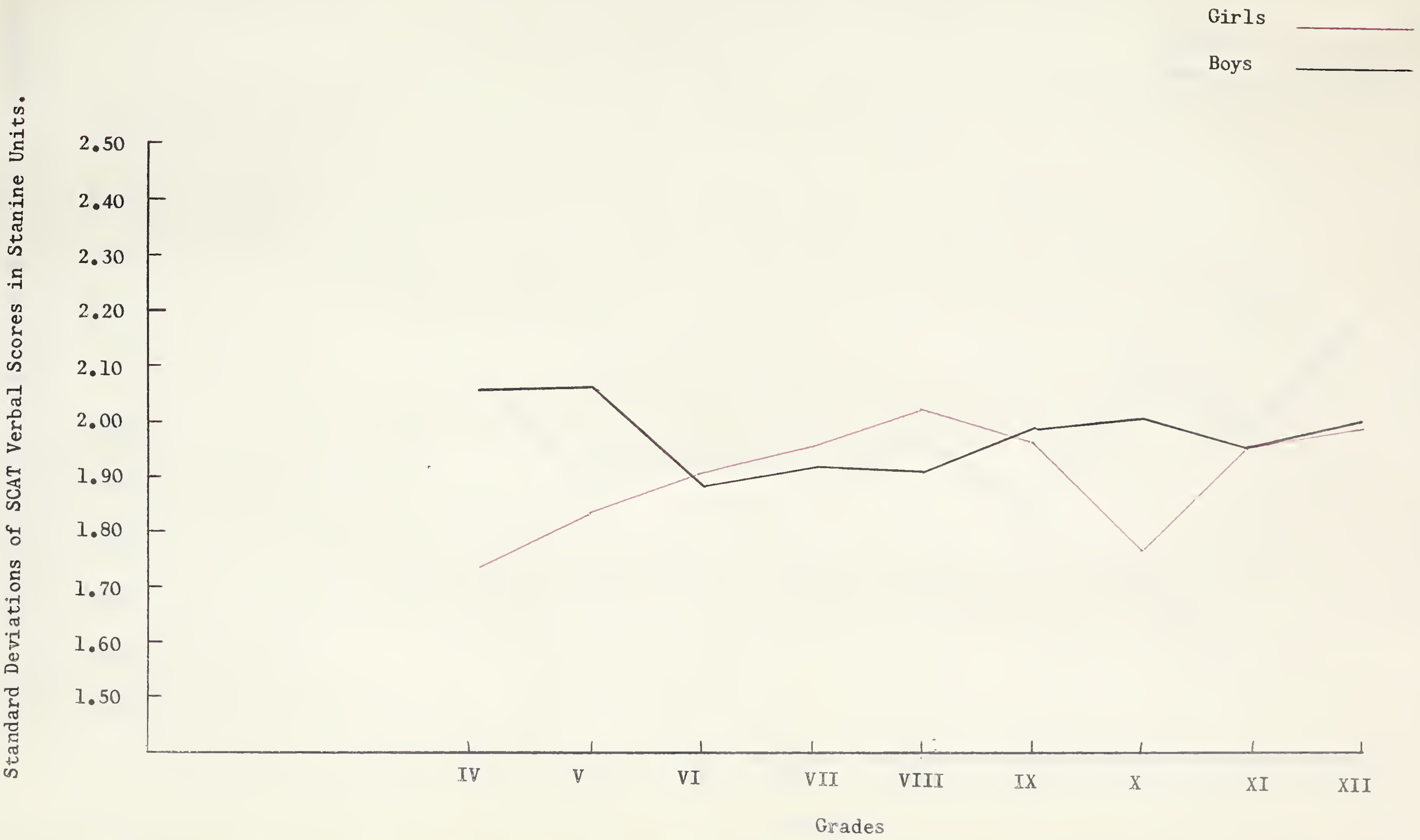

Figure 8. Comparison by Sex and Grade of Standard Deviations of SCAT Verbal Scores, in Stanine Units.

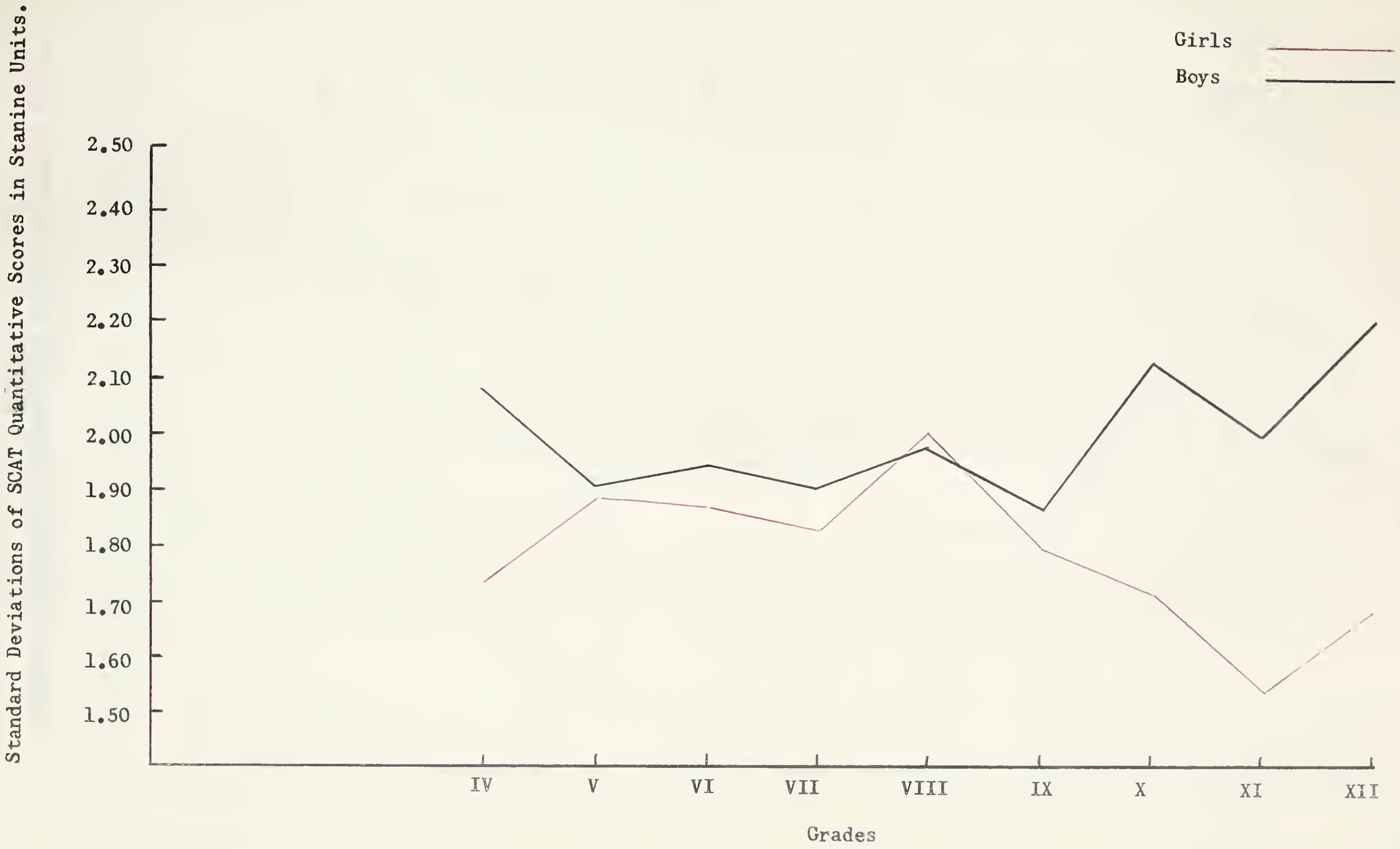

Figure 9. Comparison by Sex and Grade of Standard Deviations of SCAT Quantitative Scores, in Stanine Units.

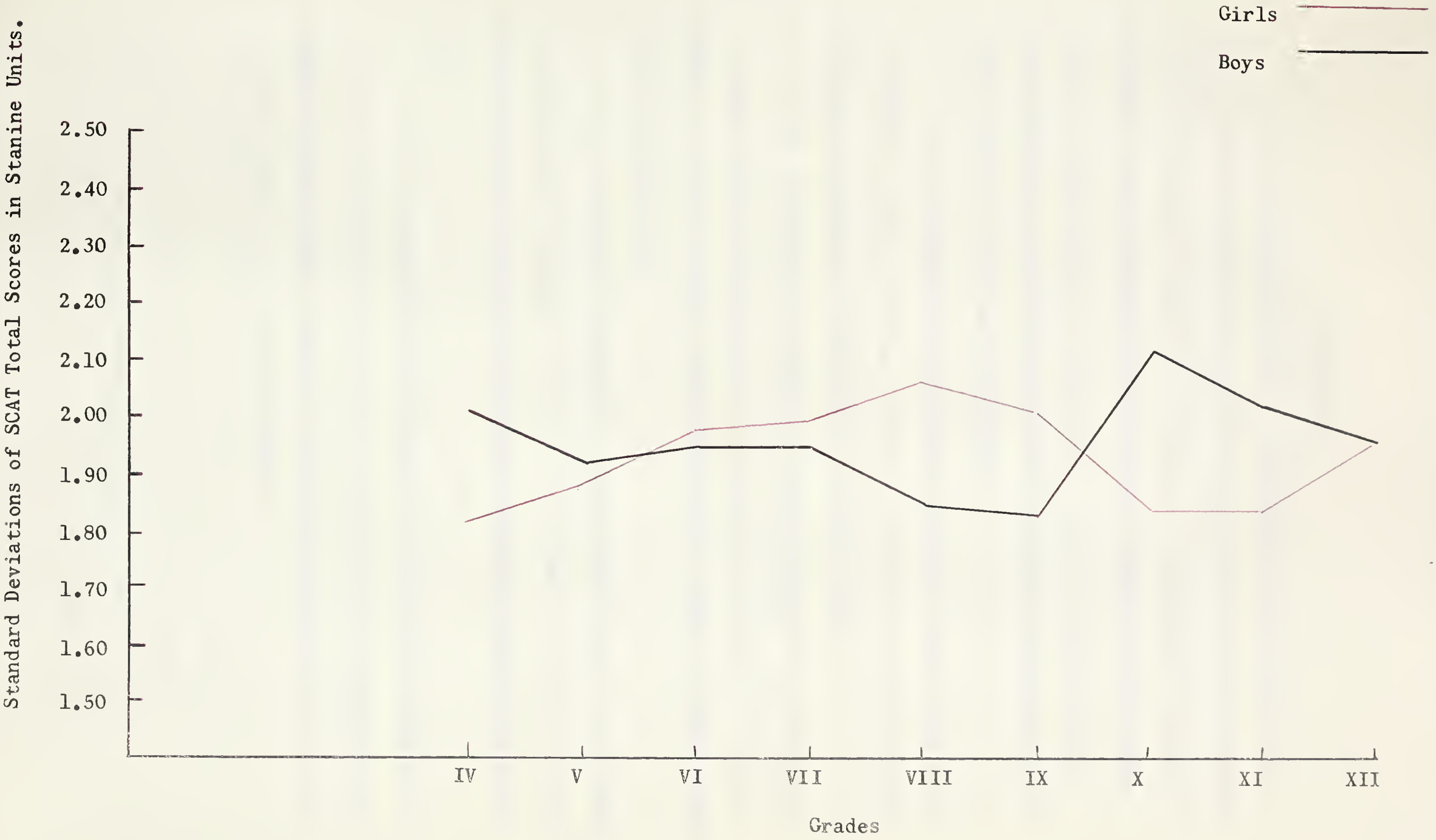

Figure 10. Comparison by Sex and Grade of Standard Deviations of SCAT Total Scores, in Stanine Units.

Conclusions

1. The girls revealed a significant superiority in Otis I.Q. scores in grades four, five and seven, and almost so in grade six, the prepuberal period of accelerated female physical growth. SCAT Total scores confirmed this finding in grades five and seven and, to a lesser degree, in grade four. Prior to grade four and after grade seven the differences, while favoring the girls in all grades save nine, were non-significant.

2. No significant differences appeared in the three sets of scores for grades one, two and three, although the girls showed a slight superiority in non-verbal and total scores.

3. There was no evidence of any consistent sex differences in verbal ability throughout any appreciable portion of the twelve grades, although the girls were significantly superior in SCAT Verbal scores in grade four.

4. There was evidence of a trend toward female superiority in quantitative thinking in grades four to seven. In grades eight, nine and ten the situation was reversed with the trend favoring the boys.

5. No significant differences in variability occurred in any of the intelligence test scores. It may be noted that the non-significant differences generally tended to be greater for the males except in grades six, seven and eight.

CHAPTER FOUR

ACHIEVEMENT IN MATHEMATICS, SCIENCE AND SOCIAL STUDIES

Reports of findings on sex differences in achievement in school subjects are more in agreement than are reports on sex differences in intelligence, although complete agreement is rare in the findings of investigators in any area dealing with human abilities and achievement. Investigations in mathematics, science and social studies are no exception. Disagreement is due, partly at least, to the types of tests used, to the items making up the tests, and to differences in the population sampled. Even so, there is sufficient agreement in studies of achievement in subject matter areas to permit the drawing of conclusions that are generally accepted.

There seems to be no real doubt that girls obtain higher scores on achievement tests (Terman and Tyler, 1954; Terman, 1925; Johnson, 1938; Summerskill and Darling, 1955; Carter, 1952). The acceptance of sex equality in general mental ability makes this phenomenon of female superiority in school achievement of considerable interest. Various reasons have been put forth to account for this difference.

Brown and Bryan (1957) attributed girls' greater success in school work to innate differences in intelligence. It is generally agreed that girls are superior to boys in linguistic ability (Anastasi, 1958; Terman and Tyler, 1954; Vernon, 1950; Traxler and Spaulding, 1954), and that this ability plays an important part in school learning. Instruction and examinations are chiefly verbal. Girls are also neater in handwriting and in written work (Lincoln, 1927), particularly in the lower grades. This skill is attributed by Vernon (1950) to the girls' superior manual dexterity which, in turn, is related to their accelerated physical

growth and development (Anastasi, 1958). No doubt neatness influences the mark that teachers assign to written work.

In his study of the gifted, Terman (1925) related the greater achievement of girls to more home study, more regular attendance, and a better attitude toward school. Similarly, Anastasi (1958) was of the opinion that their success in school is influenced by their more compliant and cooperative disposition which has been acquired through enculturation and acceptance of the feminine role which society prescribes for them.

Female superiority in achievement carries through college, according to de Ridder (1952) whose study revealed that college men did not achieve as much as women in relation to their abilities. He felt that men have greater adjustment problems to face due to parental pressure for sons to gain an education and to make vocational choices. There is also pressure for participation in campus activities and athletics and many students are compelled to engage in part time work. Summerskill and Darling (1955) concluded, too, that girls adjust better to the academic environment of college. In their analysis of the records of 188 students entering college during a single year, women accounted for a relatively small proportion of scholastic failures. In the high school, as well, they noted that girls generally obtain better grades than boys even though the latter are a more select group and make a better showing on standardized achievement tests. It is to be remembered, also, that school grades received by boys and girls are not entirely the result of the pupils' intelligence. Personality and other characteristics of the students and teachers play an important part (Anastasi, 1958).

Related Studies

There is almost unanimous agreement that the performance of boys in mathematics and science is superior to that of girls. The majority of the studies indicate that boys also perform better in social studies. Moreover, superior performance by the boys in these subjects tends to increase as the students mature and advance through the grades (Terman, 1925). Because sex differences in achievement in mathematics and science increase markedly with age, Terman (1925) assumed that cultural factors cause divergence of interests and activities which result in higher test scores by the boys where numerical and quantitative thinking are required. With reference to the boys' greater achievement in social studies, Anastasi (1958) added that cultural factors also account for the boys' greater fund of general information which stems from their less restricted environment and wider range of reading interests.

There are many studies on sex differences in mathematics, some of which report differences favoring the girls, even in this predominantly masculine domain. Grossnickle (1937), Olson (1929), Terman and Tyler (1954), Hobson (1947), Havighurst and Breese (1947), Buckingham and MacLatchey (1930), among others, found that girls generally excelled in the lower grades, but mainly where computational skills, number concepts and counting were involved. Other studies have shown that where merely simple computational skills are required the girls have the advantage at all levels of the elementary and high schools (Terman and Tyler, 1954; Heilman, 1933; Climenhaga, 1955; Hobson, 1947; Havighurst and Breese, 1947). McNemar (1942), Climenhaga (1955), Terman

and Tyler (1954), and Sweeney (1953) have reported that boys excel where abstract reasoning is required. The majority of the studies agree that the boys are superior on arithmetic reasoning and in higher complex functions, while the girls do better on routine computational skills. Supporting this evidence are the studies of Osborne (1939), McNemar (1942), Terman and Tyler (1954), Sweeney (1953), and Stroud and Lindquist (1942).

One of the better summaries of the studies of sex differences is that of Terman and Tyler (1954). They concluded that sex differences in mathematics are small in the lower school grades where routine computation is involved, but they increasingly favor the boys as the more complex levels of arithmetic reasoning are reached. Research and research workers tend to support this conclusion.

Studies of achievement in science have led to a similar conclusion. Boys generally excel in this area, but again, there is not complete agreement. Some of the better evidence of masculine superiority comes from reports of the annual American Science Talent Search. Edgerton and Britt reported in 1944, and again in 1947, that each year more than three times as many men as women apply to take this test. Even though it would appear that the women who write the test are more highly selected, scores made by the men are significantly higher. Findings by Jordan (1937), Learned and Wood (1955), Scheinfeld (1943), and Anastasi (1958), all show the same general trend toward a statistically significant masculine superiority in achievement in science. Osborne (1939) reported on an investigation among 8,785 high school students who were asked to select, from a list of five, the subjects which they felt were the hardest. Physics and chemistry were the two that stood out as unquestionably harder

for the girls.

Studies in the elementary school, and particularly in the very early grades, show a less clear-cut division between the sexes. The boys in Terman's (1925) group of gifted children in grades three to eight made consistently better scores than the girls, but the differences were not statistically significant. Heilman (1933) reached the same conclusion when he tested nine hundred Denver ten year olds on the nature study and science section of the Stanford Achievement Test Battery. The report of Terman and Tyler (1954) on studies of types of thinking of preschool children related to science achievement have yielded no significant sex differences. These authors concluded that differences in ability in science develop during the school period and are related more to interests than to basic abilities. They also emphasized that one of the most clear-cut and consistent sex differences at the high school level and above is in achievement in science. A summary of the studies of sex differences in achievement in science shows a general and gradual increase from a slight difference in the preschool years to a significant superiority in favor of the boys at the high school and college levels.

Only a few studies provide evidence of sex differences in achievement in social studies. Anastasi (1958) reported that boys excel in certain information areas such as history and geography, and Osborne (1939) showed that high school girls experience difficulty in subjects involving the social sciences. Indirect evidence of male superiority in social studies was also indicated in Vineyard's (1958) comparison of high school freshmen grades with results on the Differential Aptitude Tests. Surveys made of large numbers of elementary school children using the

Stanford Achievement Test Battery have been summarized by Traxler and Spaulding (1954). The results showed that boys scored significantly higher than girls on the social studies subtests of the battery. This brief review of the evidence of sex differences in achievement in social studies points to the superiority of the boys at both the elementary and high school levels.

While there is considerable information in the literature on sex variability in intelligence, little exists concerning spread of achievement test scores. The most reliable information available is that of McNemar and Terman (1936). They surveyed the data on test scores in achievement and concluded that while the results were not consistent there was some evidence supporting the hypothesis of greater male variability.

The foregoing survey of the literature points toward appreciable sex differences in achievement in mathematics, science and social studies. An analysis of the findings suggests the following conclusions:

1. Sex differences in achievement in mathematics are small in the lower school grades where routine computation is involved, but they increasingly favor the boys as the more complex levels of arithmetic reasoning are reached.

2. Sex differences in achievement in science show a general and gradual increase from a very small difference in the preschool years to a definite superiority in favor of the boys at the high school and college levels.

3. The evidence of sex differences in social studies achievement supports the idea of limited male superiority in all grades.

4. The evidence on sex variability in achievement, while inconsistent, tends to support the hypothesis of greater variability in males.

The Clover Bar Data

The Clover Bar testing program provided test scores on the arithmetic reasoning and arithmetic computation subtests of the Stanford Achievement Test Battery for grades one, two and three. Science and social studies were not subtests of this battery. Data for the remaining grades were obtained from the mathematics, science and social studies tests of the Sequential Tests of Educational Progress (STEP). The results of test scores are tabulated in Tables XIV, XV, XVI and XVII, showing mean score and standard deviation by sex and grade. Critical ratios between the means and the standard deviations are also given. The significance of differences is listed only when it is less than the .05 level. The means and standard deviations were obtained from the stanine distributions of the raw test scores.

Table XIV shows the tabulation of data for arithmetic reasoning and arithmetic computation for grades one, two and three. An examination of these data suggests similar achievement and variability of scores between the boys and girls in each of these grades. The only significant mean difference between the sexes was in grade two arithmetic computation at the .05 level. All other differences, both in means and in variability of scores, were not significant. The girls, however, obtained higher mean scores in all three grades, except in grade three arithmetic reasoning, while the boys showed a wider range of scores on all tests except in grade one arithmetic reasoning. From these data we may conclude that the

primary boys and girls perform about equally well in arithmetic reasoning and arithmetic computation. Studies point toward the general superiority of girls in arithmetic computation. The significant difference favoring the Clover Bar girls on this test in grade two, and their greater mean scores in grades one and three, although not significant, tend to confirm this finding.

TABLE XIV.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE STANFORD ACHIEVEMENT TEST BATTERY, PRIMARY AND ELEMENTARY FORMS: GRADES ONE, TWO AND THREE

	Arithmetic Reasoning			Arithmetic Computation		
GRADE	I	II	III	I	II	III
N Boys Girls	173 181	164 148	145 119	175 177	163 147	147 119
Mean Boys Girls	5.10 5.15	4.91 5.17	5.08 4.97	5.01 5.15	4.65 5.07	4.89 5.24
S.D. Boys Girls	1.81 1.82	2.00 1.76	1.94 1.84	2.03 1.96	1.84 1.78	2.04 1.78
t	.26	1.22	.47	.66	2.04	1.50
Sig. t					.05	
F	1.01	1.28	1.11	1.07	1.07	1.31
Sig. F						

The data of the STEP mathematics tests are tabulated in the following table. The means, standard deviations, and levels of significance of sex differences are given at each grade level for the boys and girls in grades four to twelve. In these tests, the boys

TABLE XV.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE STEP MATHEMATICS TEST: GRADES FOUR TO TWELVE

GRADE		IV	V	VI	VII	VIII	IX	X	XI	XII
N	Boys	157	134	127	123	122	97	70	57	42
	Girls	140	146	125	107	104	105	75	43	28
Mean	Boys	4.96	4.99	5.02	4.83	5.24	5.40	5.70	5.21	5.38
	Girls	5.21	4.95	4.97	5.33	4.74	4.57	4.40	4.65	4.36
S.D.	Boys	1.95	1.94	2.01	1.90	1.92	1.91	1.89	2.06	1.84
	Girls	1.73	1.91	1.87	1.97	2.04	1.94	1.88	1.84	2.10
t		1.16	.17	.20	1.95	1.87	3.06	4.14	1.43	2.09
Sig. t							.01	.01		.05
F		1.26	1.03	1.17	1.07	1.13	1.04	1.01	1.26	1.31
Sig. F										

obtained higher mean scores in all grades except four and seven.[1] Only three of the differences were significant. The boys were significantly superior in grades nine[2] and ten at the .01 level of confidence, and at the .05 level in grade twelve. There were no significant differences in the variability of the test scores.

In summary: the data indicate that the boys were superior to the girls on the STEP mathematics test in grades eight to twelve, and significantly so in nine, ten and twelve. No similar consistency of pattern appeared in grades four to seven. The Clover Bar findings are

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[1] Grades four and seven girls were found to be significantly superior to the boys in Otis I.Q. at the .01 level of confidence.

[2] Grade nine boys were also found to be significantly superior to the girls in SCAT Total scores at the .05 level of confidence.

in close agreement with those in the literature on sex differences. Standardized achievement tests in mathematics show little difference between the sexes in the early school grades, but a superiority in favor of the boys gradually develops, becoming pronounced as the high school grades are reached.

The results of the STEP science tests (Table XVI) are similar to those of the mathematics tests. The boys again obtained higher mean scores in all grades with the exception of grades four and seven. Five of the differences were significant. The superiority of the boys attained significance at the .01 level in grades six, nine, ten and eleven, and at the .05 level in grade twelve. Again there were no significant differences in variability of scores, although the boys were more variable than the girls in six of the nine grades under considerat-

TABLE XVI.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE STEP SCIENCE TEST: GRADES FOUR TO TWELVE

GRADE	IV	V	VI	VII	VIII	IX	X	XI	XII
N Boys	158	132	123	123	121	95	70	57	40
Girls	141	147	123	109	103	104	76	42	30
Mean Boys	4.86	5.06	5.36	4.91	5.12	5.45	5.51	5.40	5.38
Girls	5.20	4.88	4.61	5.17	4.90	4.55	4.45	4.33	4.50
S.D. Boys	2.07	2.19	1.98	1.95	2.00	1.84	1.85	2.03	2.00
Girls	1.77	1.80	1.76	1.95	1.88	1.97	1.84	1.74	1.62
t	1.53	.58	3.12	1.01	.84	3.33	3.47	2.82	2.03
Sig. t			.01			.01	.01	.01	.05
F	1.38	1.47	1.26	1.00	1.13	1.14	1.01	1.36	1.53
Sig. F									

ion. There is again, in science as in mathematics, the consistent superiority of the boys over the girls from grade eight to grade twelve. The tendency for the Clover Bar data to show a gradual increase in male superiority through the elementary and high school grades lends support to research findings on sex differences in science achievement.

In Table XVII, where the STEP social studies tests results are tabulated, a third pattern emerges which is similar to those observed in the data for mathematics and science. Higher mean scores were obtained by the boys on the social studies tests in all grades with the exception of grades seven and eight. Only in grades seven and eight did the girls' mean score exceed that of the boys, with the difference attaining significance at the .05 level in grade seven. The tendency toward similar variability of scores is evidenced in the social studies results, although

TABLE XVII.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE STEP SOCIAL STUDIES TEST: GRADES FOUR TO TWELVE

GRADE		IV	V	VI	VII	VIII	IX	X	XI	XII
N	Boys	157	133	124	123	122	94	71	55	40
	Girls	140	147	124	108	100	103	75	43	29
Mean	Boys	5.03	5.03	5.19	4.74	4.95	5.22	5.10	5.11	5.50
	Girls	4.97	4.97	4.90	5.30	5.03	4.82	4.83	4.84	4.17
S.D.	Boys	2.11	2.21	2.09	1.94	1.95	1.86	1.98	2.07	1.91
	Girls	1.82	1.77	1.84	1.94	1.96	2.02	1.91	1.85	2.06
t		.26	.25	1.16	2.19	.30	1.45	.84	.68	2.72
Sig. t					.05					.01
F		1.34	1.56	1.29	1.00	1.01	1.18	1.08	1.25	1.17
Sig. F			.02							

the boys exhibited slightly greater spread in five grades. Only in grade five was the difference favoring the boys, significant at the .02 level of confidence.

The differences between the boys' and girls' mean scores in grades eight to twelve were not as marked for the social studies as for the mathematics and science. This is in keeping with the general research findings of limited male superiority in social studies in all grades, although the significant superiority of the Clover Bar girls in grade seven injected a note of disagreement. Nevertheless, the pattern of superiority in male achievement found in mathematics and science is supported in social studies.

In summary, it may be stated that sex differences between the Clover Bar boys and girls in achievement test scores in mathematics, science and social studies support the second hypothesis of male superiority in these areas, which was formulated to give direction to this study. The differences, too, were similar to those reported in the research literature. Studies indicate that boys and girls in the primary grades perform about equally well on tests of arithmetic reasoning and arithmetic computation, but where even small differences occur they tend to favor the boys in the former (McNemar, 1942; Terman and Tyler, 1954; Sweeney, 1953) and the girls in the latter (Terman and Tyler, 1954; Hobson, 1947; Havighurst and Breese, 1947). While the grade one, two and three girls generally obtained higher mean scores on both sections of the arithmetic test, only in grade two computation was the difference significant. The grade three boys had the larger mean scores in arithmetic reasoning. No significant differences in variability of scores occurred in these three

grades, but the small differences tended to favor the boys.

Results of the mathematics achievement tests in grades four to twelve showed non-significant mean differences in the elementary grades, but there was a definite superiority favoring the boys when the high school grades were reached. Similar patterns emerged in both the science and social studies test scores, but the superior achievement of the boys over the girls in the high school grades in social studies was not nearly as marked as in mathematics and science. Only one significant difference in spread of scores appeared in the twenty-seven differences of the three test areas. Generally, the boys' range exceeded that of the girls, with seventeen differences favoring the former and eight the latter. Six of the girls' greater differences in spread of scores occurred in grades seven, eight and nine.

Patterns of Sex Differences

Figures 11, 12, 13 and 14 portray more clearly the patterns of sex differences in scores provided by achievement tests in mathematics, science and social studies. The primary arithmetic scores are graphed in Figure 11 while the mathematics, science and social studies results for grades four to twelve are compared in Figures 12, 13 and 14 respectively. Mean scores are stated in stanines. Grades where significant differences between the sexes occur are emphasized by red circles on the graphs. The conclusions to be drawn from each figure follow.

Figure 11. Comparison by Sex of Mean Arithmetic Scores, Grades One, Two and Three. A significant difference favoring the girls was found in computation scores in grade two with a trend toward female superiority in grade

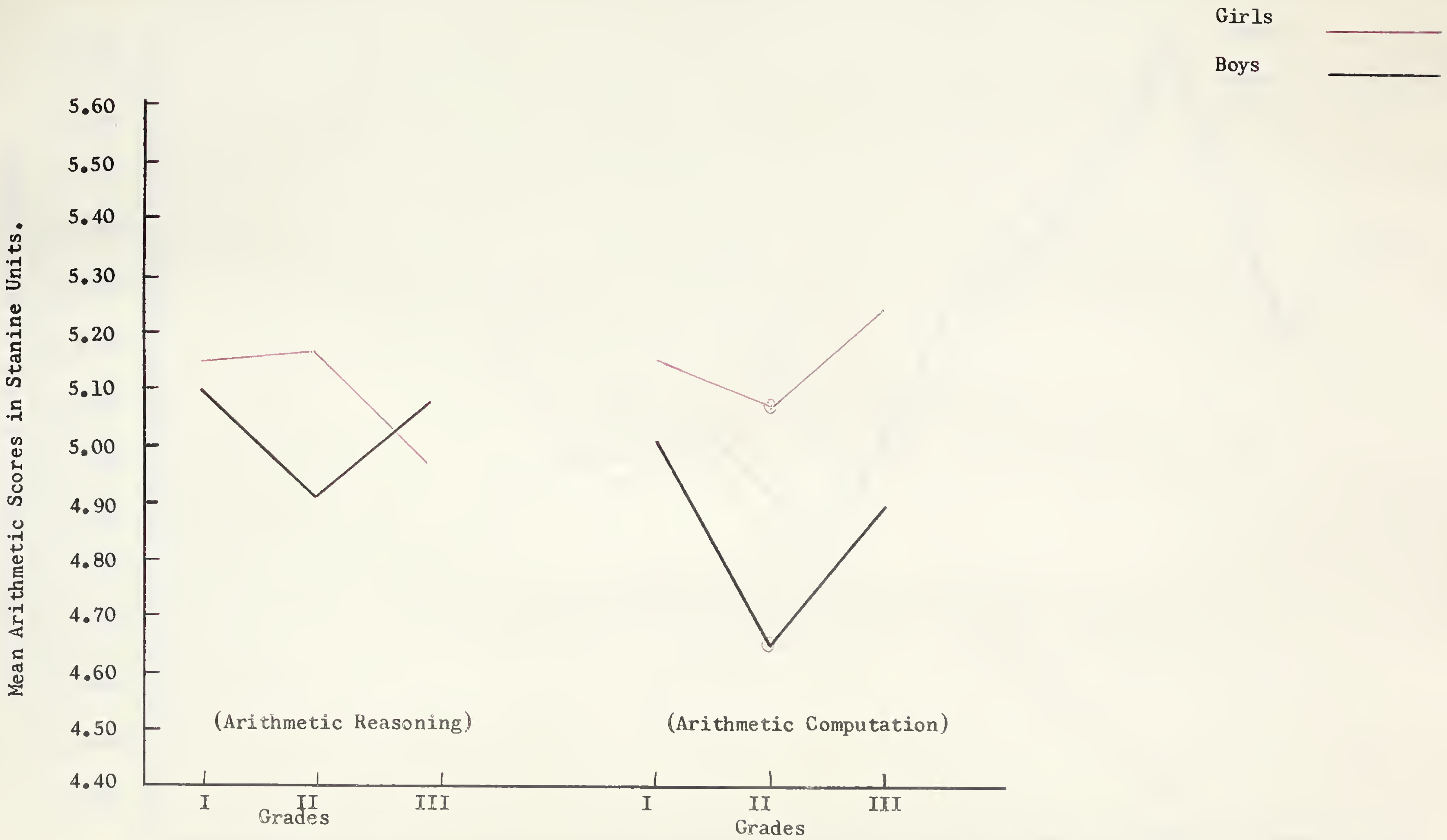

Figure 11. Comparison by Sex of Mean Arithmetic Scores, Grades One, Two and Three, in Stanine Units.

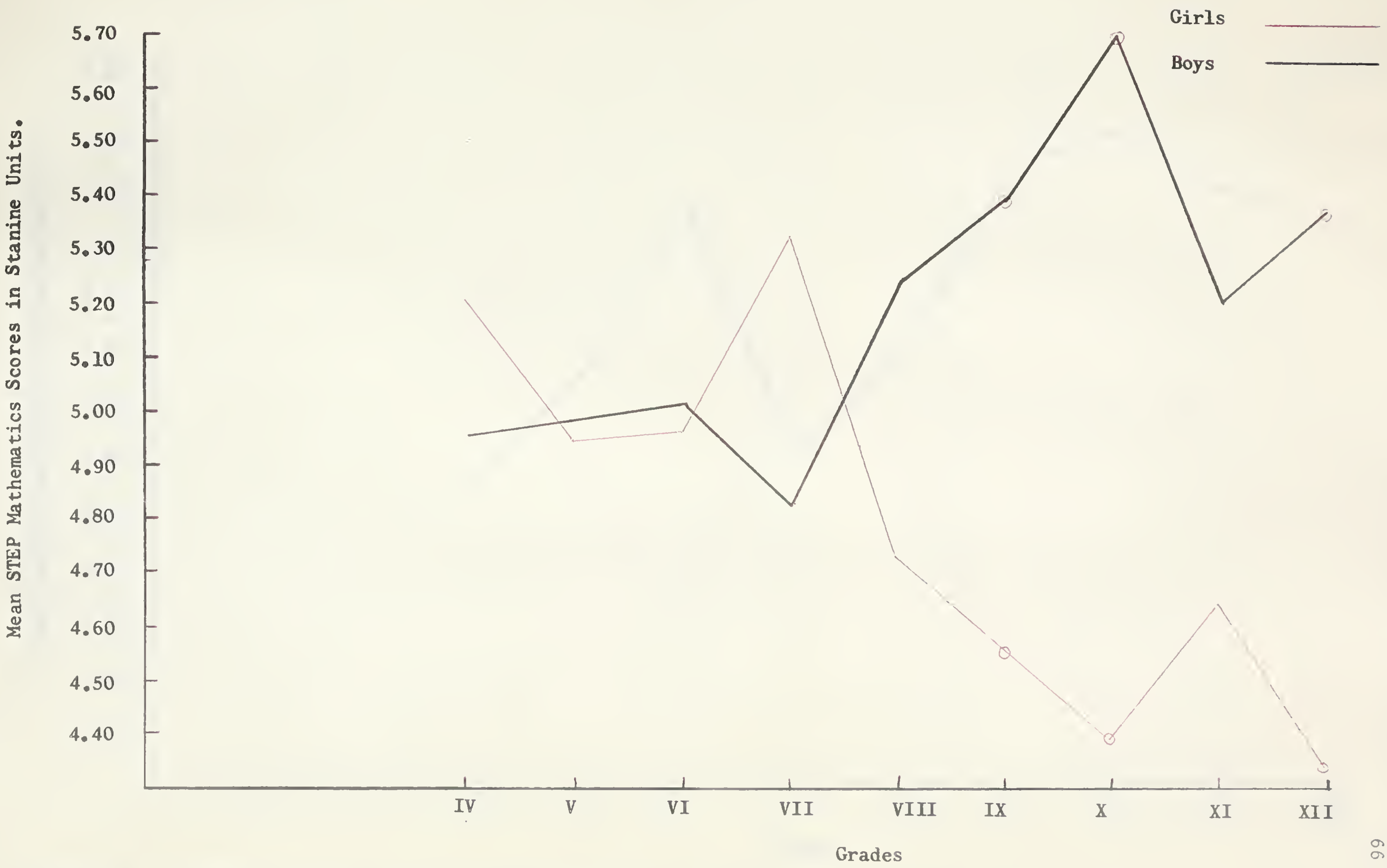

Figure 12. Comparison by Sex of Mean STEP Mathematics Scores, Grades Four to Twelve, in Stanine Units.

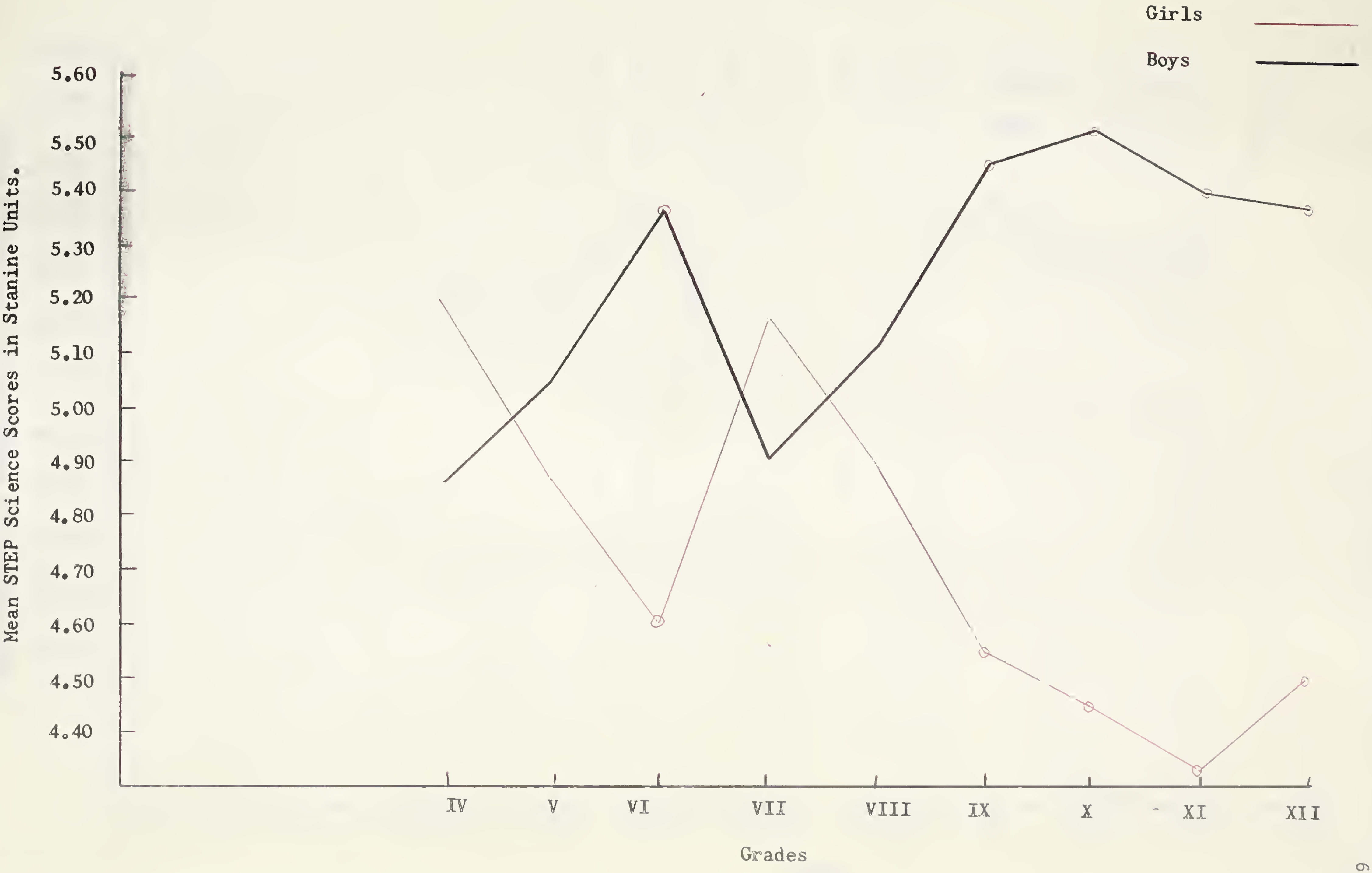

Figure 13. Comparison by Sex of Mean STEP Science Scores, Grades Four to Twelve, in Stanine Units.

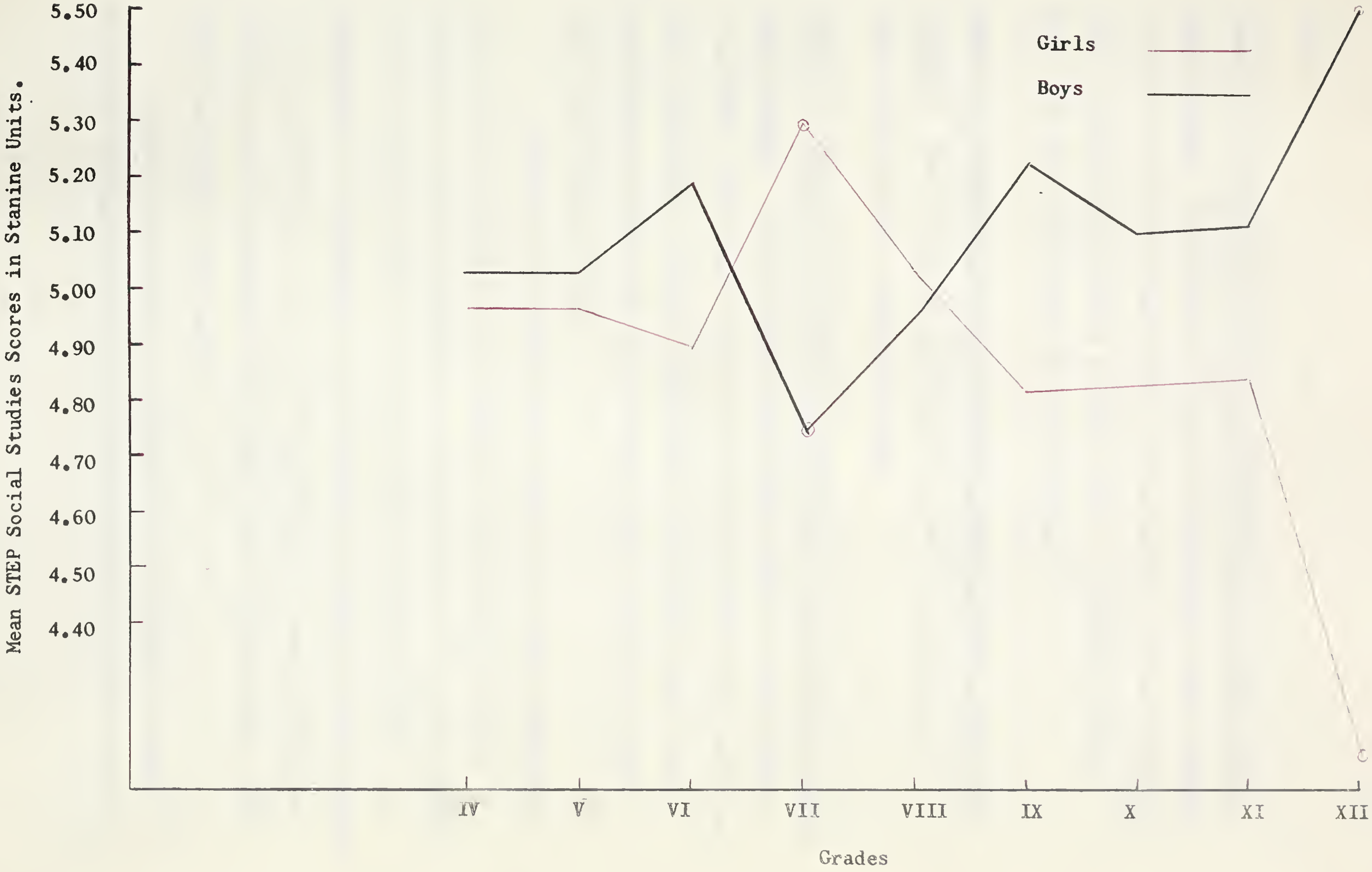

Figure 14. Comparison by Sex of Mean STEP Social Studies Scores, Grades Four to Twelve, in Stanine Units.

three.

Figure 12. Comparison by Sex of Mean STEP Mathematics Scores, Grades Four to Twelve. Significant differences in mathematics scores favoring the boys were found in grades nine, ten and twelve, with the difference almost attaining significance in grade eleven. Differences before grade nine were inconsistent and non-significant.

Figure 13. Comparison by Sex of Mean STEP Science Scores, Grades Four to Twelve. The boys proved significantly superior in science scores in grades six, nine, ten, eleven and twelve.

Figure 14. Comparison by Sex of Mean STEP Social Studies Scores, Grades Four to Twelve. The girls were significantly better in social studies at the grade seven level. Thereafter the boys showed a consistent trend toward superiority, attaining significance at the grade twelve level. The differences between the sexes in grades four, five and six were slight but favored the boys.

A pattern of sex differences common to the three achievement areas has been detected in this analysis of the Clover Bar scores. Throughout the data for mathematics and science and, to a lesser degree, for social studies, there is a common pattern of early similarity and inconsistency of achievement for the two sexes followed by fairly consistent male superiority at the level of significance or near significance from grade nine in mathematics and science, and in social studies from grade seven through grade twelve.

There is considerable evidence in the literature in support of this trend. Heilman (1933), working with ten year old school children in

Denver, and Burt (1921), with eight year old youngsters in England, found non-significant sex differences in computation and arithmetic reasoning, although mean scores in the former favored the girls, and in the latter, the boys. In mathematics, as the sexes move up through the grades and more complex reasoning skills are involved, the superiority of the boys becomes significantly evident. Heilman's study also compared the boys and girls in science achievement but the sex differences shown by his findings were not large. Learned and Wood (1938) and Jordan (1937) reported marked superiority of the boys in high school and college in science achievement. Traxler and Spaulding (1954) produced evidence of significant male superiority in elementary social studies. It is evident that research findings substantially confirm the pattern of sex differences in achievement in mathematics, science and social studies of the Clover Bar boys and girls.

Variability. Sex differences in variability of test scores in achievement in mathematics, science and social studies were non-significant in all three sets of tests, except in grade five social studies where the boys' greater spread of scores attained significance at the .02 level of confidence. Comparative spreads of scores by sex and grade are presented graphically for each achievement area in the accompanying figures: primary arithmetic in Figure 15, mathematics in Figure 16, and science and social studies in Figures 17 and 18 respectively. The most valuable research on sex variability is that of McNemar and Terman (1936). They concluded that there were no significant differences in variability in test scores between the sexes; and that the small differences which do appear generally favor the boys. The finding from the Clover Bar data that the boys and girls have approximately equal variability in achievement

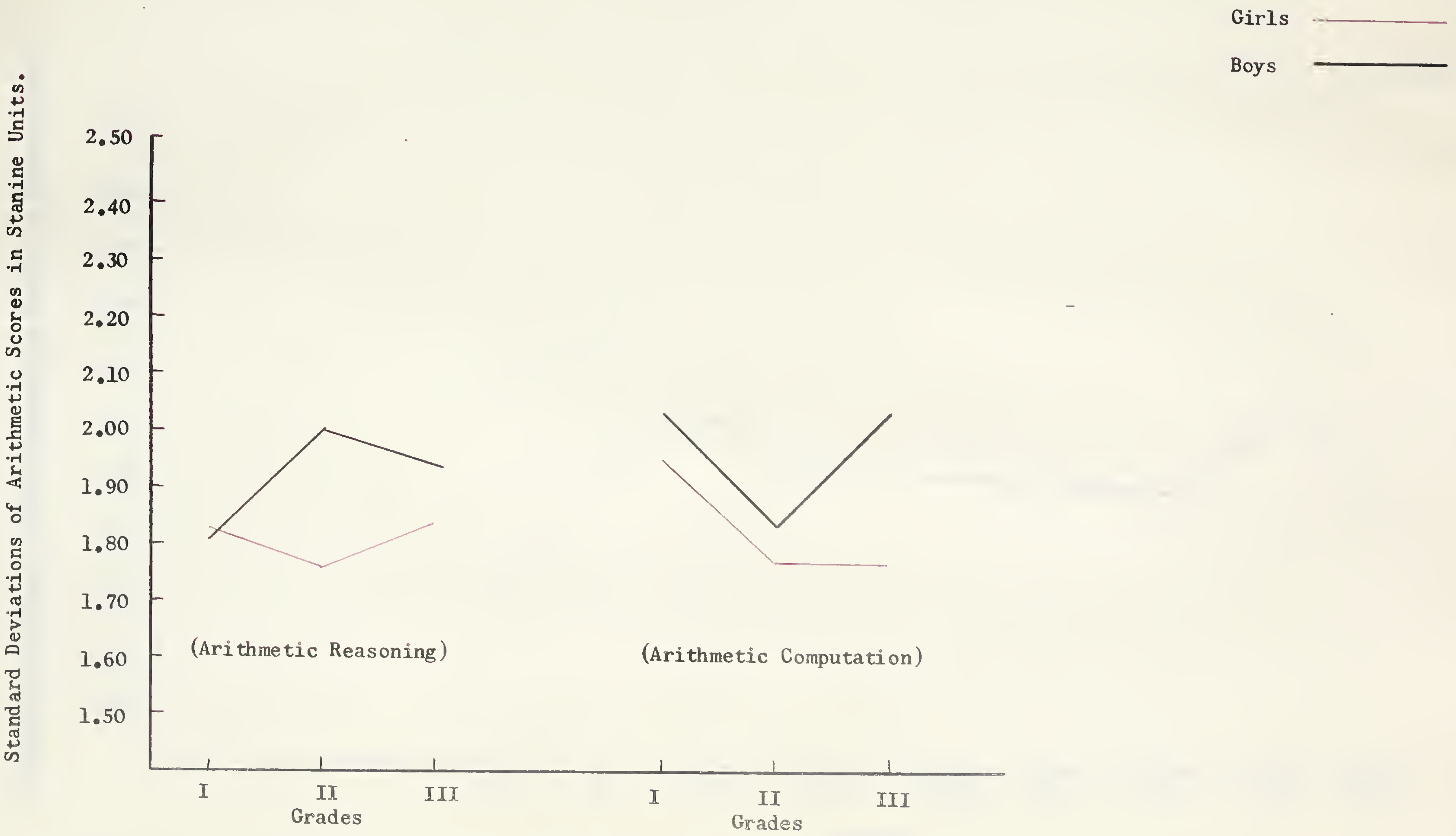

Figure 15. Comparison by Sex of Standard Deviations of Arithmetic Scores, Grades One, Two and Three, in Stanine Units.

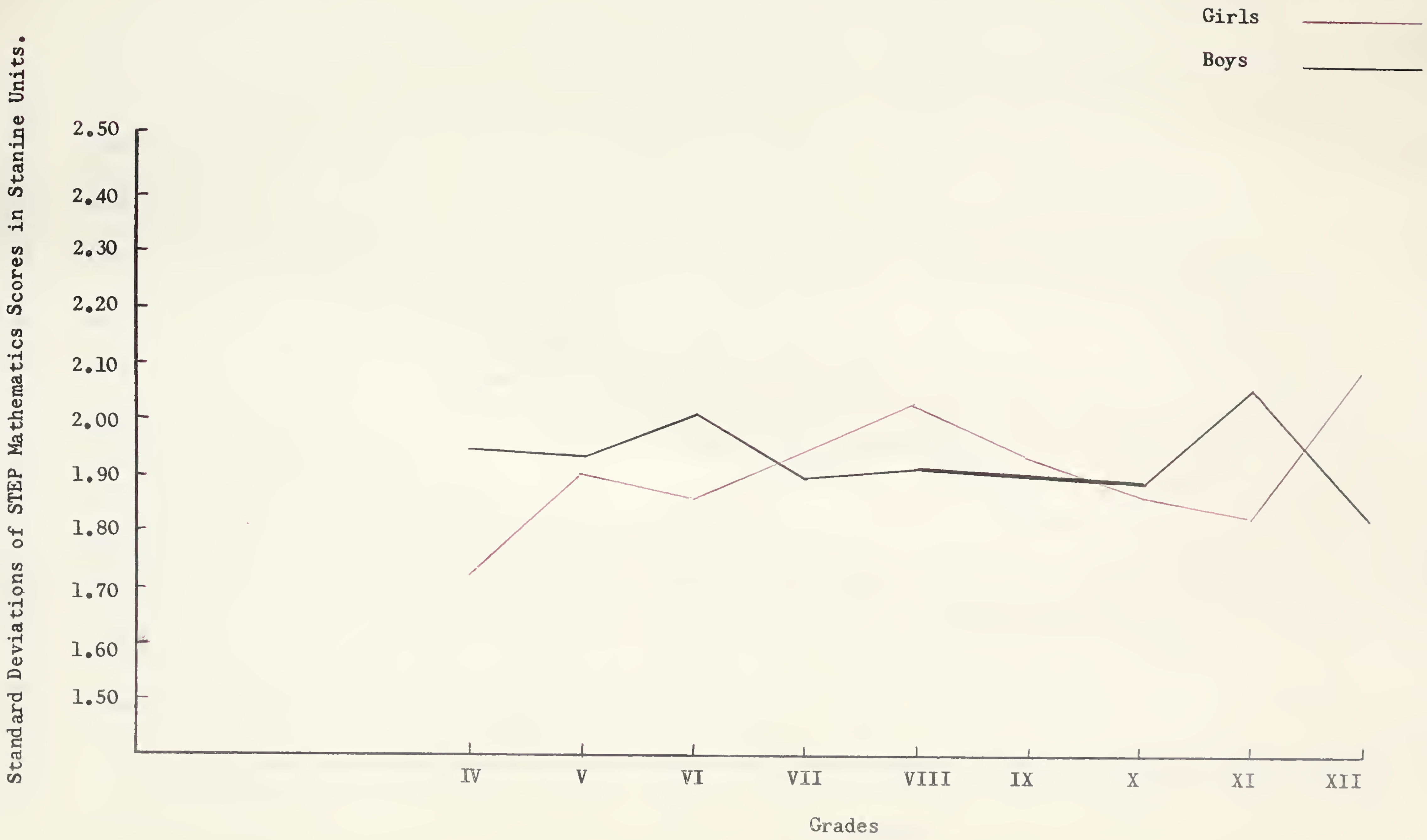

Figure 16. Comparison by Sex and Grade of Standard Deviations of STEP Mathematics Scores, in Stanine Units.

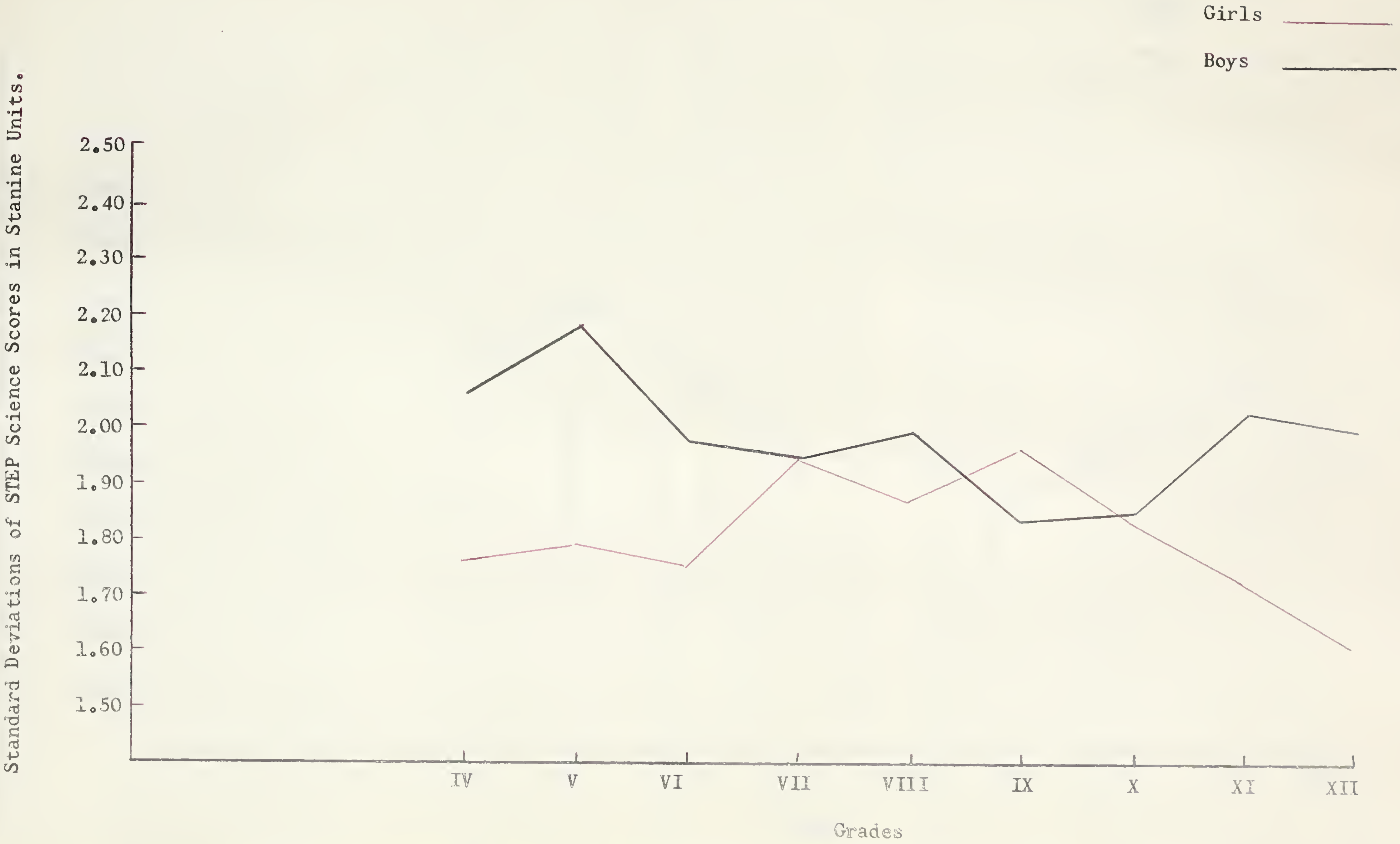

Figure 17. Comparison by Sex and Grade of Standard Deviations of STEP Science Scores, in Stanine Units.

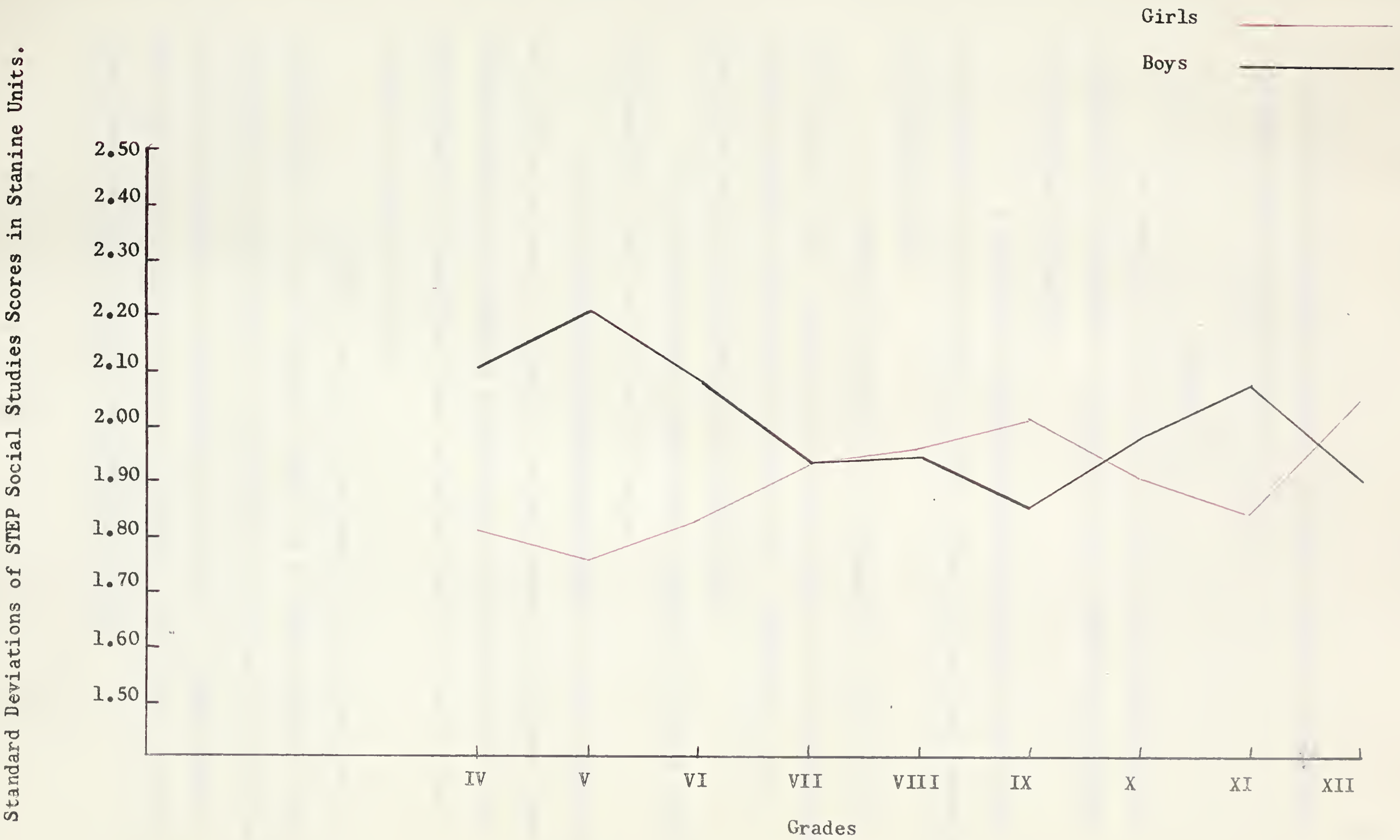

Figure 18. Comparison by Sex and Grade of Standard Deviations of STEP Social Studies Scores, in Stanine Units.

test scores in mathematics, science and social studies is therefore consistent with existing research evidence.

Conclusions

The analysis of the Clover Bar data on sex differences in achievement in mathematics, science and social studies has produced the following conclusions:

1. A significant difference favoring the girls was found in computation scores in grade two with a trend toward female superiority in grade three.

2. Significant differences in mathematics scores favoring the boys were found in grades nine, ten and twelve, with the difference almost attaining significance in grade eleven. Differences before grade nine were inconsistent and non-significant.

3. The boys proved significantly superior in science scores in grades six, nine, ten, eleven and twelve.

4. The girls were significantly better in social studies at the grade seven level. Thereafter the boys showed a consistent trend toward superiority, attaining significance at the grade twelve level. The differences between the sexes in grades four, five and six were slight but favored the boys.

5. Throughout the data for mathematics and science and, to a lesser degree, for social studies, there was a common pattern of early similarity and inconsistency of achievement for the two sexes followed by fairly consistent male superiority at the level of significance or near significance from grade nine in mathematics and science, and from grade seven in social studies, through grade twelve.

6. Sex differences in variability of test scores in mathematics, science and social studies were non-significant in all three sets of tests, except in grade five social studies where the boys' greater spread of scores attained significance.

CHAPTER FIVE

ACHIEVEMENT IN THE COMMUNICATION SKILLS: LANGUAGE, READING, LISTENING, ESSAY, WRITING

Man is a social animal. He has an urge to communicate, to speak and to write his thoughts. He seeks, also, to listen to and to read the thoughts and ideas expressed by others. Intercommunication with his fellows is important to his existence and progress. As a consequence, a large proportion of the developmental period of the young of a society is given over to the formal mastery of those skills considered necessary to effective communication. Much of the child's activity in the classroom centers on reading in that it is basic to his other learnings and is related to many of his academic and behavior problems. Expression of his ideas in written form is also emphasized as the child advances through the grades. Classroom learning depends, too, on the ability to listen--a phase of communication which, according to Hook (1959), received very little attention prior to 1940. Investigations since 1950, however, have emphasized the importance of listening, or auding, as it is becoming known, as an integral part of classroom learning (Caffrey, 1955a, 1955b; Furness, 1957).

Related Studies

Linguistic abilities and skills are closely related to general intelligence (Strickland, 1947). Traxler and Spaulding (1954) noted that results of standardized achievement tests reveal sex differences corresponding closely to those found in intelligence and aptitude tests. The influence of linguistic abilities on intelligence test scores was also emphasized by Vernon (1950). Cronbach (1949) warned that a low score on the typical group intelligence test at the high school level is

as likely to be indicative of ineffective reading as it is of low mental ability. He added that much of the variation in scores on group intelligence tests is due to the verbal nature of the items. Anderson, Hughes and Dixon (1956) tended to agree with Cronbach. Their study on rate of reading development implied that improved reading ability makes for higher scores on tests of intelligence. Watts (1944) observed that a person's mastery of language is a reliable index of his intellectual powers; while Anastasi (1958) credited girls' superiority on a number of common intelligence tests partly, at least, to the predominance of verbal content in such tests. Dolch (1931) maintained that intelligence is the strongest single factor in a child's success in reading.

The evidence is strong that boys lag behind girls in linguistic development. Female superiority in verbal or linguistic ability has been noted from infancy to adulthood (McCarthy, 1954), and sex differences have been found in almost every aspect of language development. Whether children are gifted, normal or feebleminded, McCarthy's findings all point to the same conclusions: girls talk earlier than boys, they have larger preschool vocabularies, they use sentences earlier, they make more rapid progress in reading, and they reach a higher level of articulation at a younger age. Opinions differ concerning the reasons for this difference in language ability. Investigations by Stagner (1952), Freeman and Miles (1950) and Vernon (1950) emphasized cultural influences such as differences in interests and experience, although Vernon felt that cultural factors could not account entirely for girl babies starting to talk at an earlier age than boy babies. A study by Getman (1950) suggested that the earlier development of girls' visual systems may be a contributing factor. Other investigators have given considerable weight to the differ-

ential in growth rate between the sexes (Anastasi, 1958; Pauley, 1951; Anderson, Hughes and Dixon, 1956; Olson, 1949; and Anderson and Dearborn, 1952). Due to the more rapid physical acceleration of the girls, inequalities arise in amount of training and general environmental stimulation. Even though there is no proof of an accompanying intellectual acceleration, Anastasi (1958) felt that physical acceleration may have some effect on intellectual development. It is possible that it may be an important factor in girls' more rapid acquisition of linguistic skills and their progress in them. Anderson and Dearborn (1952) drew attention to the fact that differences in reading ability show up early but tend to disappear as the boys and girls approach maturity. This, they believed, supported the hypothesis of a differential developmental ratio as a cause of sex differences in language. In their ten year longitudinal study of language development, Freeman and Flory (1942) reported a slightly better performance on language tests by the girls between ages eleven and thirteen and by the boys between fifteen and seventeen. These differences in performance seemed related to the growth spurts before and during adolescence, thus making it difficult to discard the possibility that a growth factor may be operating.

One of the most extensive investigations of achievement in linguistic abilities and skills was conducted by Stroud and Lindquist (1942). They reported on the results of a state wide testing program carried on in the schools of Iowa in which the Iowa Every-Pupil Test of Basic Skills was employed. By selecting every tenth boy and girl, samples were obtained of 3,000 to 5,000 pupils in each grade from grade

three to eight. On the language tests the performance of the girls was found to be significantly superior in all of the six grades involved. Female superiority reached significance, too, in reading comprehension in grades three and four and in reading vocabulary in grades three, four, five and eight. Mean differences in the reading scores, however, tended to become smaller as the pupils progressed from the lower to the higher grades. Stroud and Lindquist extended their investigation into the high school where they found that the superiority of the girls in language continued, but mean differences in reading scores decreased. The reading scores still favored the girls but the differences were small enough to suggest that by the time the secondary grades were reached sex differences in reading tended to disappear.

Clark (1959) used scores on the California Achievement Tests to compare boys and girls in grades three, five and eight. When he held intelligence and chronological age constant he found no reliable sex differences in the reading scores in these grades. He noted that the girls performed better in mechanics of English and in spelling and concluded that significant sex differences exist in the language area, but differences in reading scores cannot be attributed to sex.

Other investigators confirm female superiority in language and reading skills. Traxler and Spaulding (1954) noted that in numerous surveys employing the Stanford Achievement Tests the girls invariably excelled the boys in spelling and language usage. Reports by Terman and Tyler (1954), Freeman and Miles (1950), Anastasi (1958), Osborne (1938), and Olson (1949) have pointed to the superiority of girls on most language tests. Anderson (1949) found girls significantly superior in all the elementary school grades in reading achievement. Pauley (1951) noted

that grade two girls were two months in advance of the boys on the Gates Reading Tests, while Samuels (1943), Anderson, Hughes and Dixon (1956), Carroll (1948) and Prescott (1955) reported grade one girls to be advanced in both reading readiness and reading achievement.

Sex differences in linguistic abilities have also appeared on scores derived from primary mental abilities tests. Girls made higher scores on word fluency for Hobson (1947), Havighurst and Breese (1947) and Herzberg and Lapkin (1954). There were no consistent differences, however, in word meaning: Hobson had the boys superior to the girls, Havighurst and Breese had the sexes equal, while Herzberg and Lapkin scored the girls significantly higher than the boys. Analyzing scores derived from subtests of the Differential Aptitude Tests Battery, Wesman (1949) and Bennett (1952) also reported that girls do relatively better on word fluency and in tasks involving mastery of the mechanics of language than they do in vocabulary, verbal comprehension and verbal reasoning.

Not all investigators accept the superiority of the girls in performance on reading tests. A fairly large number of studies have reported no differences in reading ability either in the elementary or high school grades. Heilman (1933) found no differences in reading achievement on the subtests of the Stanford Achievement Test Battery, nor did Coull (1956) on the California Reading Test in grade seven. Moore (1939) had the sexes performing equally well in grades six, eight, ten and twelve on the Iowa Silent Reading Tests. No differences were apparent either in reading investigations by Potter (1949), McLaren (1950) or Woody (1937). The large majority of studies, however, favor the girls in both the acquisition of reading skills and language achieve-

ment.

The development of standardized tests to measure listening ability and ability to write creatively has only recently been undertaken. The literature, therefore, carries very few reports of investigations in these areas. The information that is available tends to relate listening to the other phases of the language skills rather than to point up the differences between the sexes. Caffrey (1955b) made a comparison of boys and girls on a listening test containing seventy-five items. Three items favored the girls, three the boys, while the remaining sixty-nine showed no differences. When either chronological age or mental age was held constant the same results were obtained. No sex differences were found in similar investigations by Burton (1944), Irvine (1953), and Larsen (1940). Caffrey (1955a) also summarized the findings of research in listening to 1955. He concluded that boys tend to score slightly but consistently higher than girls, although the differences were not significant. Traxler (1958) noted a close relationship between scores on the STEP subtests and the corresponding subject marks in grades seven and eight. This may suggest that sex differences in writing skills correspond to those in general language skills.

While the existence of contradictory findings must be admitted, the weight of evidence provided by the research on sex differences in linguistic abilities points to the general superiority of girls in tests requiring the use of verbal abilities and skills. Sex differences in language and reading performance scores are fairly definite; conclusions concerning differences in listening skills are less clear-cut; while information on differences in writing skills was not found in the

literature. Very little evidence, too, concerning variability in scores on achievement tests in the communication skills has been reported in the research. The results of the McNemar and Terman (1936) survey, however, again suggest a slightly greater male variability in achievement test scores in language and reading.

The evidence for sex differences in the communication skills may be summarized as follows:

1. Girls excel in language achievement in all grades of the elementary and secondary schools.

2. Girls excel in reading in the elementary grades but the difference becomes negligible at the secondary level.

3. There are no significant differences between the sexes on listening tests although boys display slight but consistent superiority.

4. No conclusion has been drawn relative to sex superiority in the essay and writing phases of the communication skills.

5. The evidence for sex variability in achievement test scores tends to point to a greater variability in the males.

The Clover Bar Data

Test scores for the communication skills discussed in this section were compiled during the Clover Bar testing program. The language subtests of the primary and elementary forms of the Stanford Achievement Test Battery yielded three scores for grades one and two: paragraph meaning, word meaning and spelling, and an additional score in language for grade three. For the students in grades four to twelve, performance on the reading, writing, essay and listening tests of the STEP series was taken as a measure of their ability to communicate. Test results have been tabulated

in Tables XVIII to XXII showing mean scores and standard deviations, in stanines, by sex and grade. Where significant differences occur between the mean scores of the boys and girls, levels of significance are also given.

Data for the primary grades are shown in Table XVIII. An examination of the table shows no significant differences in mean scores in any of the tests for grade one. There was only one test in grade three where the girls' mean score exceeded the boys' significantly at the .01 level. The grade two girls were significantly superior in all three tests, surpassing the boys in paragraph meaning, word meaning and spelling at the .01 level. In only one test, grade three word meaning, did the mean score of the boys exceed that of the girls, and this was not significant. In

TABLE XVIII

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE STANFORD ACHIEVEMENT TEST BATTERY, PRIMARY AND ELEMENTARY FORMS: GRADES ONE, TWO AND THREE

	Paragraph Meaning			Word Meaning			Spelling			Language
GRADE	I	II	III	I	II	III	I	II	III	III
N Boys Girls	169 180	162 149	149 120	173 180	166 149	149 120	173 180	165 148	149 119	144 117
Mean Boys Girls	4.83 5.21	4.59 5.50	4.86 5.18	4.79 5.14	4.60 5.36	5.05 4.93	4.73 5.11	4.67 5.57	4.62 5.48	4.92 5.23
S.D. Boys Girls	2.01 1.91	1.97 1.88	1.98 1.89	2.02 1.84	2.04 1.89	2.04 1.80	2.02 2.10	2.05 1.96	1.71 2.01	1.90 2.06
t	1.81	4.54	1.35	1.70	4.32	.51	1.73	3.96	3.72	1.25
Sig. t		.01			.01			.01	.01	
F	1.11	1.10	1.10	1.21	1.17	1.29	1.08	1.10	1.39	1.17
Sig. F										

seven of the ten mean scores the boys exhibited slightly more variability than the girls, but no dispersion of scores was significant. These results are in keeping with the research findings that girls in the lower grades of the elementary school tend to perform better than boys in language, spelling and reading skills.

The relative performance of the sexes in Clover Bar on the four subtests of the STEP series for grades four to twelve is in fairly close agreement with reported findings on sex differences in these areas. Data for the reading tests, Table XIX, indicate that only three mean differences in scores were significant. The superiority of the girls attained significance at the .01 level in grades four, five and seven. Their mean scores, too, exceeded the boys' in all other grades except grade nine. The boys had the wider range of scores in six of the nine grades but significance was attained, however, only in grade four at the .02 level of confidence.

TABLE XIX

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE STEP READING TEST: GRADES FOUR TO TWELVE

GRADE		IV	V	VI	VII	VIII	IX	X	XI	XII
N	Boys	155	133	125	123	120	100	70	56	41
	Girls	143	147	126	108	102	105	73	41	25
Mean	Boys	4.65	4.52	4.86	4.37	4.88	5.10	4.87	5.00	4.76
	Girls	5.43	5.34	5.17	5.65	5.36	4.89	5.22	5.41	4.92
S.D.	Boys	2.04	2.10	2.00	1.84	1.91	1.96	1.96	1.74	1.99
	Girls	1.61	1.78	1.97	1.85	1.87	1.92	2.01	2.02	1.68
t		3.68	3.50	1.24	5.26	1.89	.77	1.05	1.05	.35
Sig. t		.01	.01		.01					
F		1.61	1.40	1.03	1.01	1.04	1.04	1.05	1.36	1.40
Sig. F		.02								

It will be recalled that the girls in grades four, five and seven were significantly superior on the Otis I.Q., as were the grade nine boys in academic aptitude (SCAT Total). The mean differences of the reading scores favor these groups, although not significantly in the case of the grade nine boys. These results tend to confirm research findings of a strong relationship between intelligence and success in reading (Strickland, 1947; Cronbach, 1949; Dolch, 1931). The trend in the Clover Bar population from significant differences in mean scores in the lower grades to non-significance in the upper is also in agreement with reports of research findings, and confirms the earlier conclusion that sex differences in reading ability tend to diminish during adolescence.

The STEP writing test measures a pupil's skills in the mechanics of English. It is apparent from the data in Table XX that the Clover Bar girls had attained a much greater mastery of these skills than the boys.

TABLE XX.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE STEP WRITING TEST: GRADES FOUR TO TWELVE

GRADE		IV	V	VI	VII	VIII	IX	X	XI	XII
N	Boys	159	131	124	123	121	100	69	56	42
	Girls	142	147	122	109	103	106	74	41	28
Mean	Boys	4.61	4.25	4.58	4.43	4.71	4.90	5.17	5.32	4.76
	Girls	5.50	5.58	5.43	5.72	5.33	5.15	5.86	6.10	6.00
S.D.	Boys	1.92	1.82	1.89	1.75	1.73	1.94	1.54	1.62	2.02
	Girls	1.89	1.86	1.92	1.91	2.18	1.97	1.85	1.50	1.72
t		4.05	5.54	3.48	5.33	2.33	.92	2.43	2.45	2.74
Sig. t		.01	.01	.01	.01	.05		.05	.05	.01
F		1.04	1.04	1.03	1.20	1.58	1.04	1.43	1.17	1.39
Sig. F										

In no grade did the boys' mean score exceed that of the girls, and in only one, grade nine, was the mean difference not significant. The girls' superior performance attained significance at the .01 level in grades four to seven and in grade twelve, and at the .05 level in grades eight, ten and eleven. There were no significant differences in the dispersion of scores although the girls' scores were more variable than the boys' in six of the nine tests. This observation is not in agreement with the generally accepted assumption that boys are more variable than girls. The data continue to lend support to the general conclusion that girls perform at a higher level in linguistic abilities and skills.

The STEP essay test is a measure of the student's ability to organize his thoughts and put them down in good form. These data for the Clover Bar boys and girls are compared in Table XXI. The superior performance of the girls is most marked. In no grade did the boys' mean

TABLE XXI.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE
ON THE STEP ESSAY TEST: GRADES FOUR TO TWELVE

GRADE		IV	V	VI	VII	VIII	IX	X	XI	XII
N	Boys	154	131	118	122	124	95	72	57	39
	Girls	140	144	125	106	102	104	75	41	27
Mean	Boys	3.64	4.09	4.26	3.77	4.19	4.35	3.92	3.93	3.87
	Girls	4.15	4.58	4.83	4.61	4.47	5.12	4.41	5.12	4.48
S.D.	Boys	1.01	1.06	.89	.94	.98	.91	1.02	1.09	.96
	Girls	.91	.95	.92	1.01	1.08	1.08	1.07	1.28	.90
t		4.59	4.02	4.91	6.46	2.01	5.97	2.87	4.47	2.63
Sig. t		.01	.01	.01	.01	.05	.01	.01	.01	.05
F		1.22	1.24	1.06	1.16	1.21	1.49	1.14	1.38	1.14
Sig. F										

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

score approach the girls'. The superiority of the latter attained significance at the .01 level in all grades except eight and twelve, in which grades the level was .05. Again, in six of the nine grades the girls exhibited slightly more variability in their test scores than the boys, but no differences were significant even at the .05 level of confidence. The suggestion of a trend toward consistently greater female variability in test scores continues on the essay test, although the difference was very slight.

Results of the STEP listening test, tabulated in Table XXII, present a totally different picture to the other three tests in the communication skills. A general pattern appears to have developed in the reading, writing and essay tests, while the scores on the listening test do not produce any apparent consistency. It might even be questioned if listening, for the Clover Bar population, involves the same

TABLE XXII.

MEANS, STANDARD DEVIATIONS AND LEVELS OF SIGNIFICANCE ON THE STEP LISTENING TEST: GRADES FOUR TO TWELVE

GRADE		IV	V	VI	VII	VIII	IX	X	XI	XII
N	Boys	157	131	121	123	123	100	69	58	42
	Girls	143	144	123	106	103	105	74	41	27
Mean	Boys	4.92	4.93	5.23	4.93	4.84	5.24	5.31	4.91	4.93
	Girls	5.03	5.12	4.82	5.19	5.14	4.78	4.86	5.10	5.11
S.D.	Boys	1.92	2.09	1.82	1.67	1.95	1.90	1.99	1.92	1.63
	Girls	2.11	1.86	2.03	2.18	2.04	2.03	1.91	2.09	2.33
t		.47	.79	1.66	1.00	1.14	1.67	1.38	.46	.35
Sig. t										
F		1.21	1.27	1.24	1.71	1.10	1.14	1.08	1.18	2.04
Sig. F					.02					

abilities as the other skills. Mean differences were small and statistically non-significant. They showed no consistent trend. Six of the differences favored the girls. The girls exhibited greater variability in their scores than the boys in seven of the nine grades, but only in grade seven was the difference significant at the .02 level. The tendency for girls to display greater dispersion of test scores in communication skills is still maintained, even though the differences are, for the most part, non-significant.

The data on sex differences in achievement in communication skills have been analyzed for the Clover Bar population. The findings have tended to confirm operational hypothesis number three formulated at the outset of this study. Support for the hypothesis of female superiority in language and in writing and essay test scores has been noted. The data have also provided substantial support for superior performance in reading in the elementary school grades by the girls. They have provided only minimal support for the implied hypothesis of female superiority in reading in the high school, and gave no suggestion of sex superiority in listening skills. The findings are in general agreement with those reported in the literature. Deviations, particularly in variability, have been noted. These may be due to the operation of chance factors or may be indicative of possible trends in the developmental processes of the child. Before discussing the trends and patterns of sex differences in relation to achievement in the communication skills, a brief review of the findings is given.

The tests used in the primary grades included paragraph meaning, word meaning, spelling and language. The language test was administered to grade three only. The girls obtained higher mean scores on all the

primary tests except on grade three word meaning. This superiority attained significance in the case of the grade two girls in all three tests and in spelling in grade three. The superiority of the grade three boys' scores in word meaning did not reach significance.

The better performance of the girls in paragraph meaning and spelling and language is in keeping with research findings in these areas. The literature suggests, too, that if there is a difference in performance in word meaning the boys usually excel. A point of interest is the significantly superior performance of the grade two girls over the boys in all three tests, including word meaning. This observation is the more interesting in view of the fact that both sexes obtained substantially equal scores on Otis I.Q.

The relative achievement of the Clover Bar boys and girls on the reading, writing and essay tests throughout grades four to twelve is worthy of note. There were twenty-seven mean differences in scores on these tests. In only grade nine reading did the boys' mean score exceed that of the girls', and this was not significant. These boys, too, were only slightly superior to the grade nine girls in Otis I.Q., but had a significantly higher score on the total score of the SCAT test. The girls' superiority on the reading, writing and essay tests was emphasized by the fact that they received twenty-six higher mean scores, twenty of which attained significance at the .01 and .05 levels of confidence. In the reading scores, significant differences favoring the girls were attained in the elementary grades, but gradually disappeared as the secondary level was reached. Their superiority in the writing and essay tests, however, was maintained throughout all the grades under consideration. These observations substantiate the generally accepted

conclusion that girls are superior to boys in tasks involving linguistic abilities and skills.

Achievement in listening has presented a different picture. The Clover Bar girls have the larger scores in six of the mean differences, the boys in three, but none was singificant nor was there any apparent pattern. These data tend to support Caffrey's (1955b) finding that the sexes perform about equally well in listening tests.

Research does not reveal any great sex differences in variability in test scores in achievement. When differences occur they are usually small and non-significant and favor the boys. The Clover Bar data, in the primary grades, confirm this hypothesis. In grades four to twelve the variability of scores did not run true to form. The spread in reading scores tended to be small and about equal for the sexes, but the writing, essay and listening test results showed the girls' scores more variable than the boys'. Of the twenty-seven differences in variability of scores for the three tests, nineteen showed greater dispersion favoring the girls. Only one of the nineteen attained significance, but the findings for the Clover Bar girls indicate a major reversal not in keeping with research findings of greater male variability in achievement.

Patterns of Sex Differences

To facilitate the detection of patterns of sex differences through the grades, five graphs of mean grade scores have been prepared. For grades one, two and three the mean scores for paragraph meaning, word meaning and spelling are shown. The remaining figures display the mean scores for reading, writing, essay and listening.

Figure 19. Comparison by Sex of Mean Language Scores, Grades One, Two and Three. The girls displayed consistent superiority to the boys in paragraph meaning and spelling, attaining significance in grade two in paragraph meaning and in grades two and three in spelling. The girls were significantly superior in word meaning in grade two with inconsistent results in grades one and three.

Figure 20. Comparison by Sex of Mean STEP Reading Scores, Grades Four to Twelve. In reading the girls achieved significant superiority in grades four, five and seven, and non-significant and declining superiority in grades six, eight, ten, eleven and twelve.

Figure 21. Comparison by Sex of Mean STEP Writing Scores, Grades Four to Twelve. In the STEP test of writing, which resembles tests of mechanics of language, the girls were superior at every grade level from grade four to grade twelve, and significantly so in all grades save grade nine.

Figure 22. Comparison by Sex of Mean STEP Essay Scores, Grades Four to Twelve. In the essay test the girls achieved significant superiority at every grade level from grade four to grade twelve.

Figure 23. Comparison by Sex of Mean STEP Listening Scores, Grades Four to Twelve. In the listening test no pattern of sex differences emerged as the sex differences were non-significant and completely inconsistent.

A general pattern of sex differences appears to have emerged from this analysis of the Clover Bar scores in the communication skills. In the writing and essay tests the girls proved significantly superior to the boys at almost all levels, while their reading scores followed a similar pattern in the early grades with a non-significant superiority from

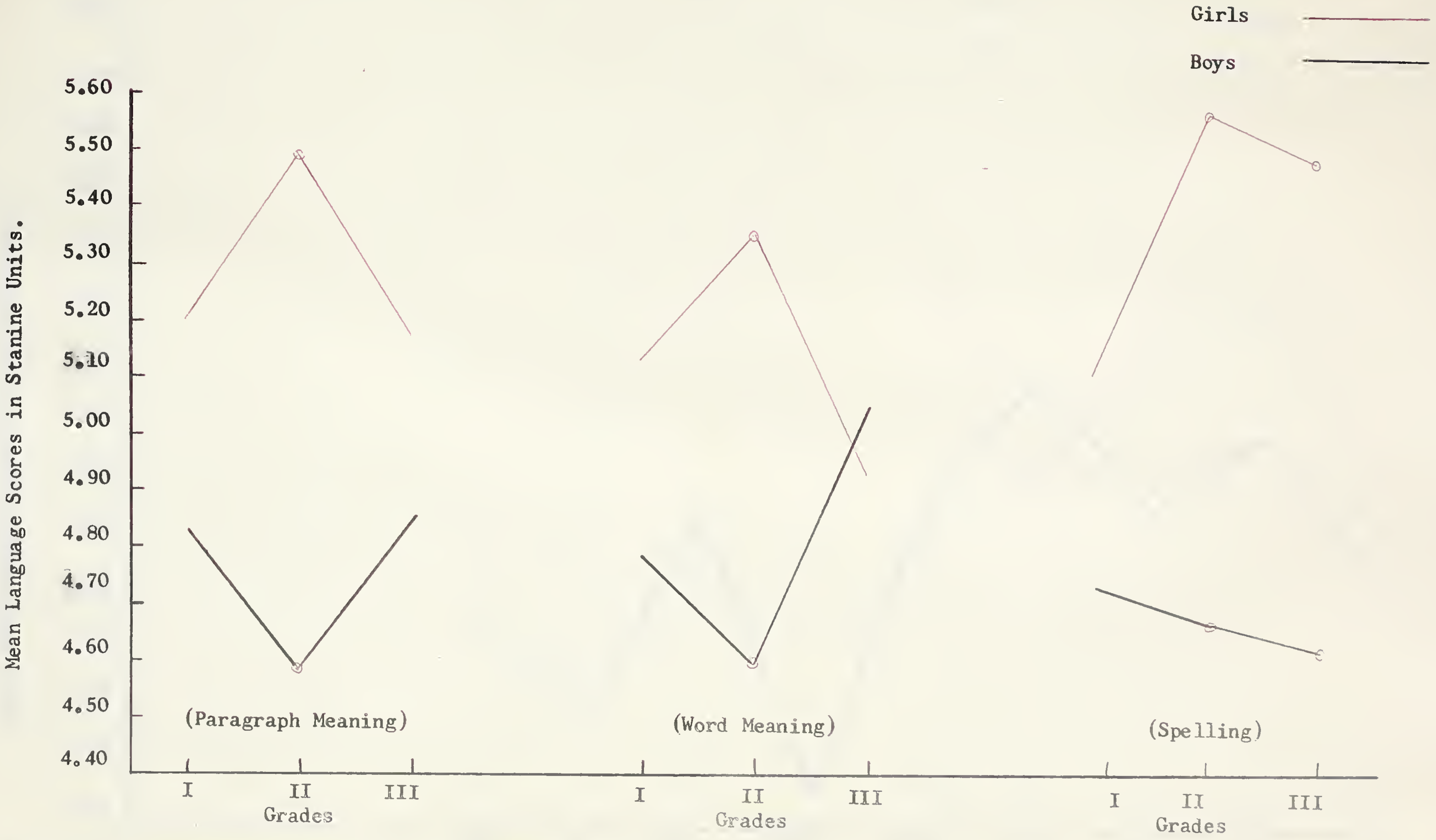

Figure 19. Comparison by Sex of Mean Language Scores, Grades One, Two and Three, in Stanine Units.

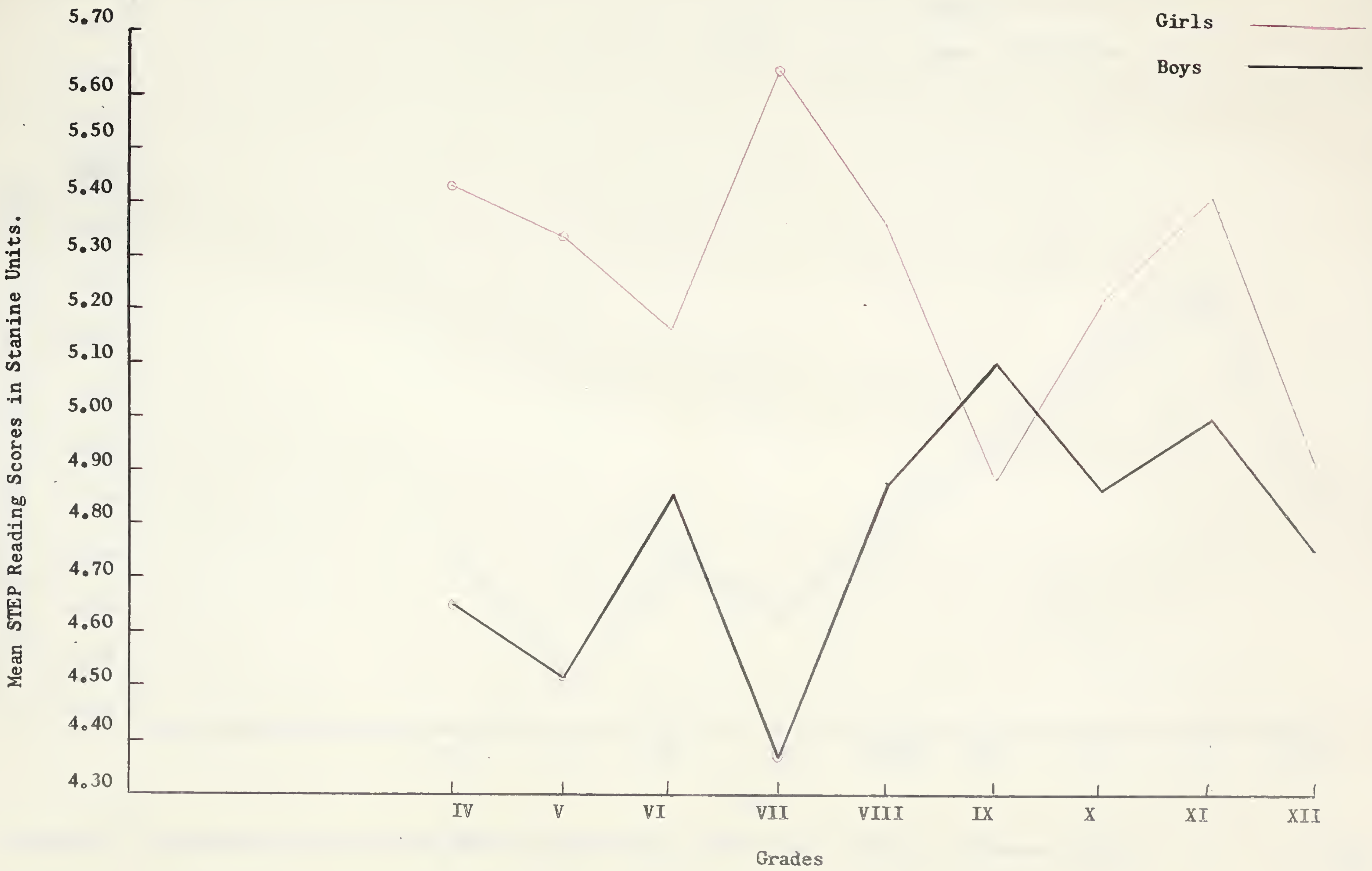

Figure 20. Comparison by Sex of Mean STEP Reading Scores, Grades Four to Twelve, in Stanine Units.

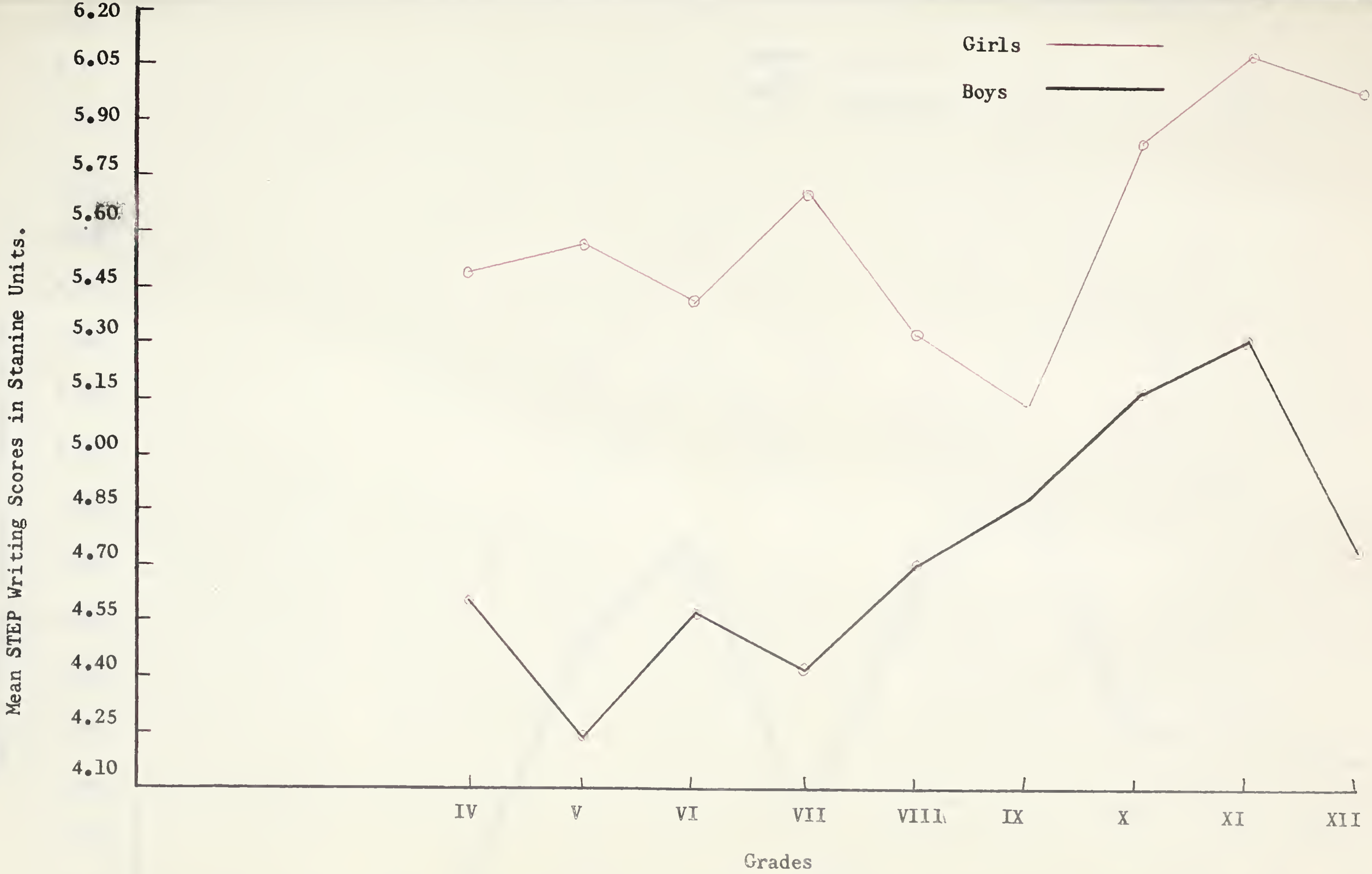

Figure 21. Comparison by Sex of Mean STEP Writing Scores, Grades Four to Twelve, in Stanine Units.

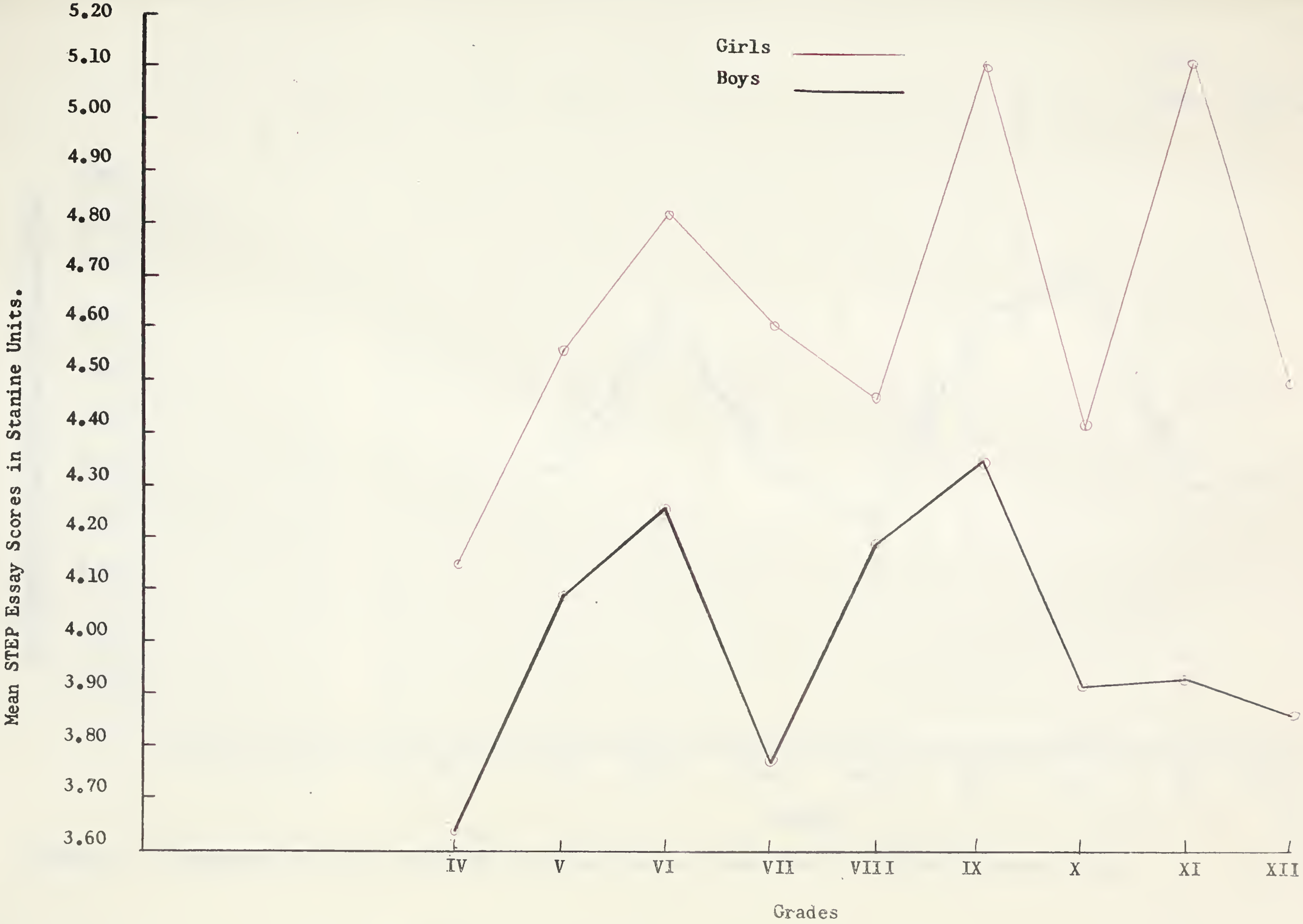

Figure 22. Comparison by Sex of Mean STEP Essay Scores. Grades Four to Twelve. in Stanine Units.

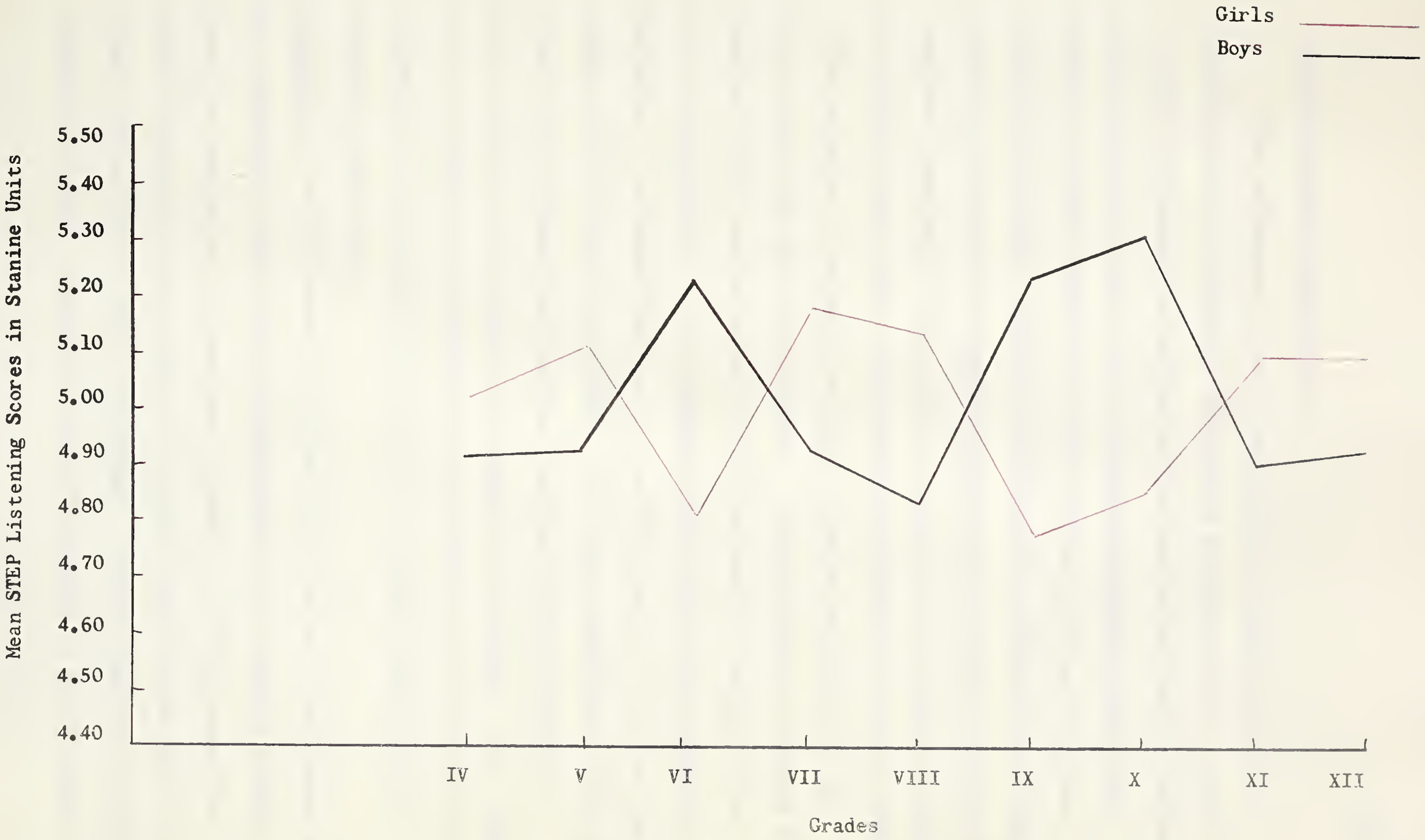

Figure 23. Comparison by Sex of Mean STEP Listening Scores, Grades Four to Twelve, in Stanine Units.

grade eight through grade twelve.

The performance of the primary girls in language skills is consistent with the findings of Traxler and Spaulding (1954) of superior female achievement in spelling and language on the Stanford Achievement Test Battery. Hobson (1947), Havighurst and Breese (1947) and Herzberg and Lapkin (1954) have pointed out that girls excel on tasks requiring word fluency. Paragraph meaning and the essay test are closely related to this function. Stroud and Lindquist (1942) have reported the consistent superiority of the girls on language tests in both the elementary and high school grades. Since the STEP writing test resembles tests of the mechanics of language, the highly superior performance of the girls on this test was to be expected. The same authors, supported by Anderson (1949), have noted that girls often excel in reading, to the level of significance, in the elementary grades, but their superiority diminishes to non-significance at the secondary level. The Clover Bar reading scores followed this pattern. The similar performance of the two sexes on the listening test was also consistent with the findings of Caffrey (1955b) in his review of the research on listening. It is evident that the patterns of sex differences emerging from the Clover Bar data on achievement in the communication skills are strongly supported by the research in these areas.

Variability. Sex differences in variability in scores in achievement in the communication skills were non-significant in all instances except in grade four reading and in grade seven listening. The boys showed the greater dispersion in test scores in the former grade and the girls in the latter, both at the .02 level of confidence. Graphs showing the relative variability in scores between the sexes are provided in the following figures.

Standard deviations by grade and sex are given for each achievement area: primary language (Fig. 24), reading (Fig. 25), writing (Fig. 26), essay (Fig. 27), and listening (Fig. 28).

An examination of the respective figures indicates that the differences in dispersion of test scores in primary language and reading are consistent with the research findings of non-significant differences tending to favor the male. The data relative to the scores in writing, essay and listening indicate a major reversal in spread of scores not in keeping with the notion of greater male variability.

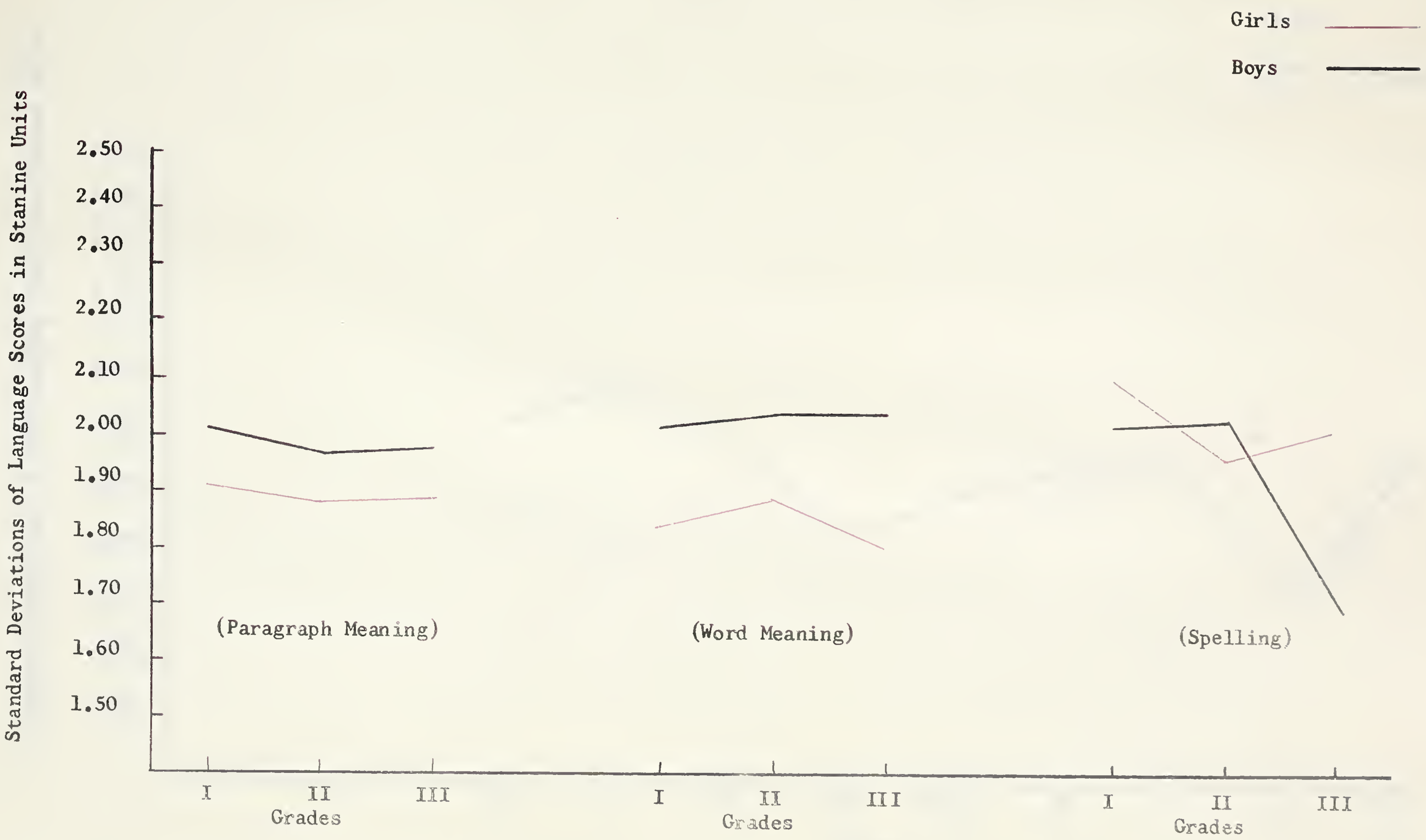

Figure 24. Comparison by Sex of Standard Deviations of Language Scores, Grades One, Two and Three, in Stanine Units.

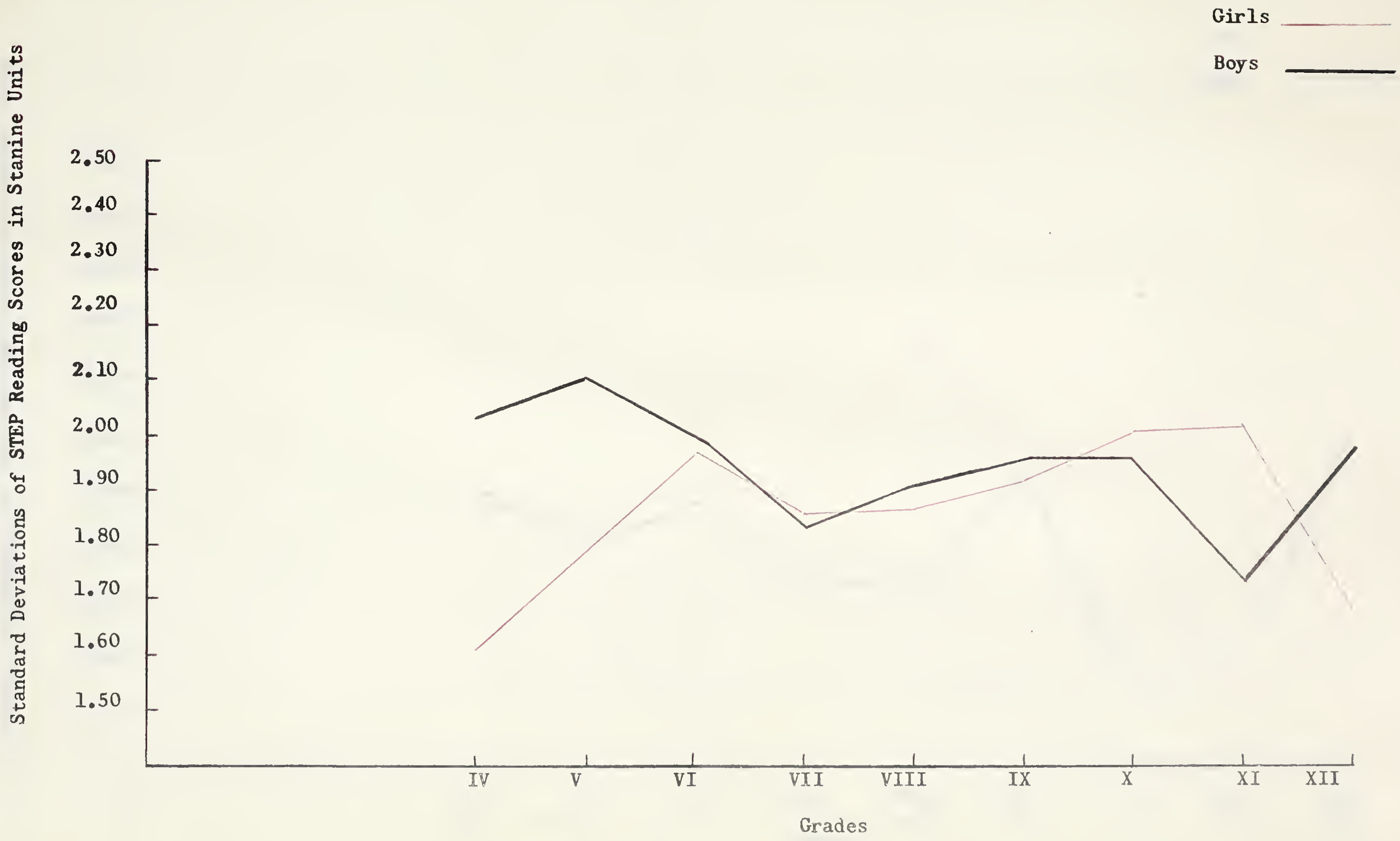

Figure 25. Comparison by Sex and Grade of Standard Deviations of STEP Reading Scores, in Stanine Units.

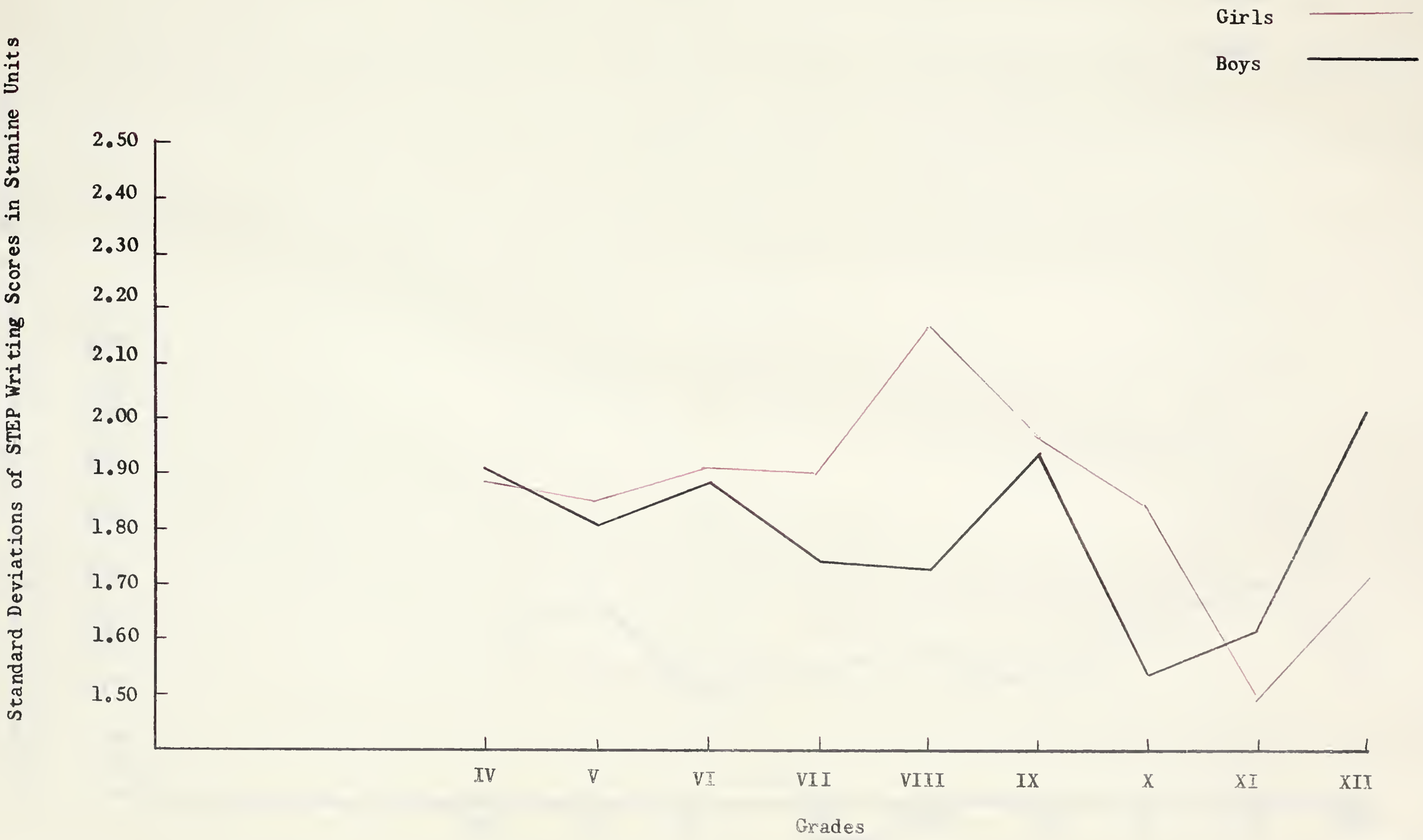

Figure 26. Comparison by Sex and Grade of Standard Deviations of STEP Writing Scores, in Stanine Units.

[illegible]

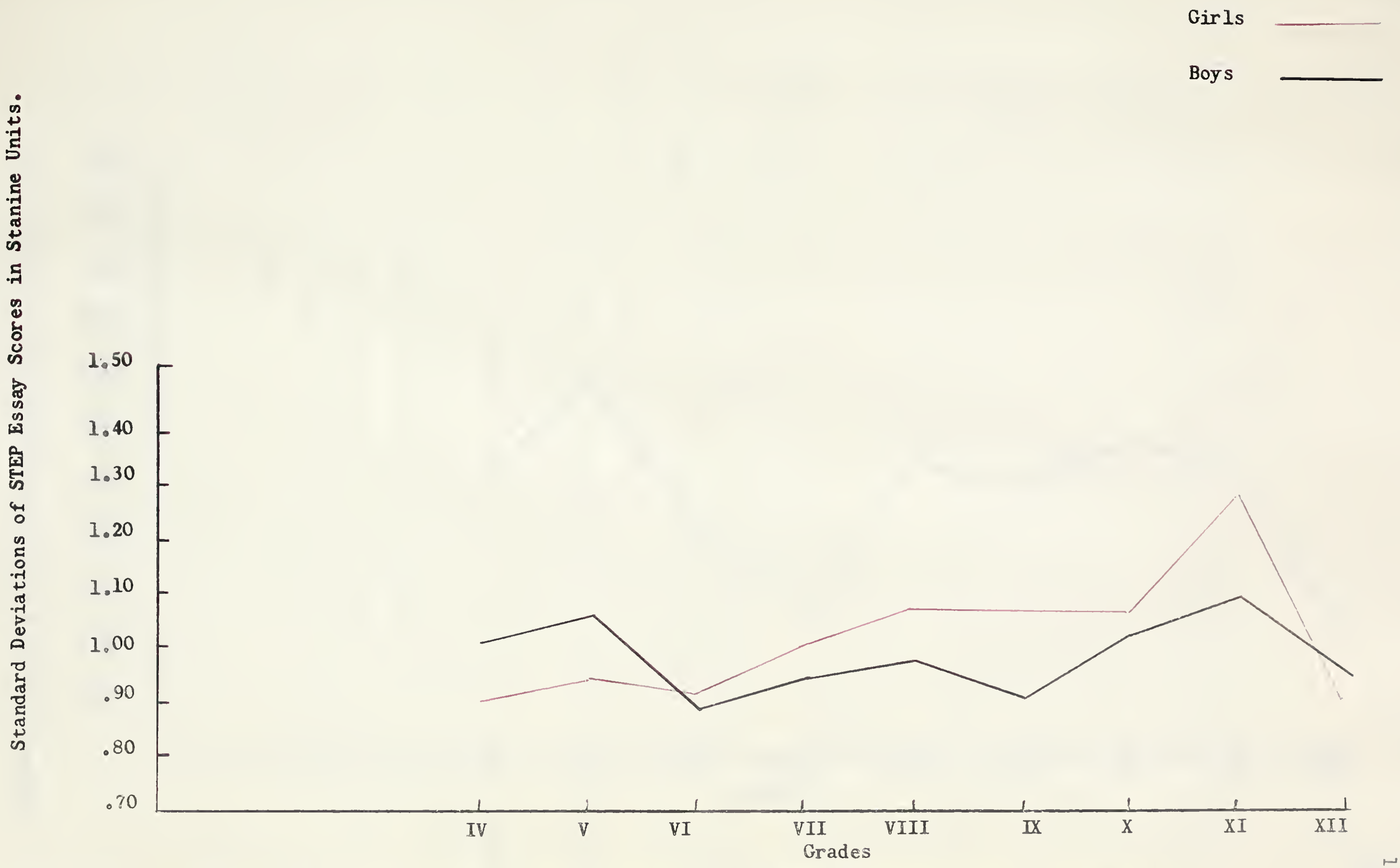

Figure 27. Comparison by Sex and Grade of Standard Deviations of STEP Essay Scores, in Stanine Units.

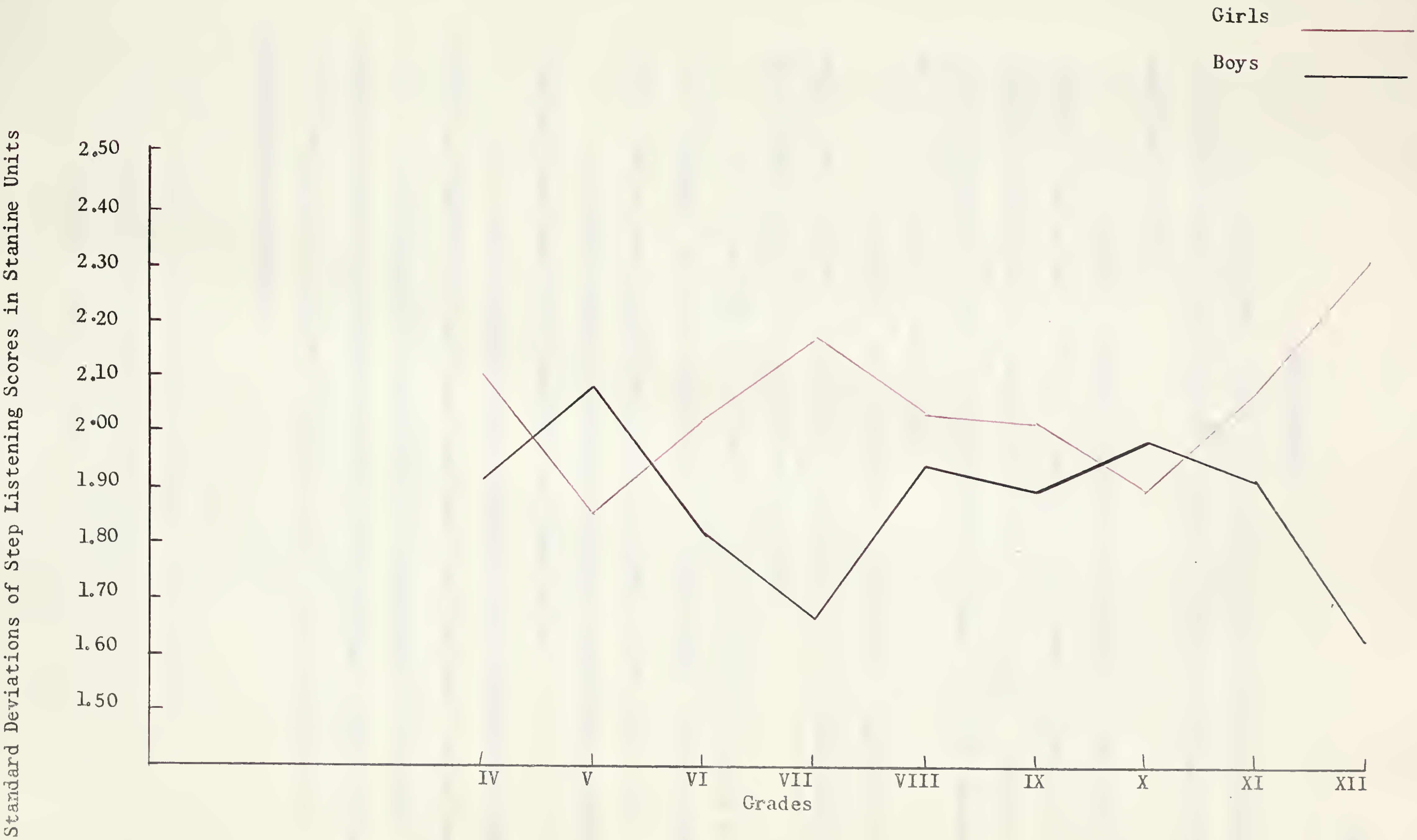

Figure 28. Comparison by Sex and Grade of Standard Deviations of STEP Listening Scores, in Stanine Units.

Conclusions

The conclusions, listed below, have arisen out of the analysis of sex differences in achievement in primary language, reading, writing, essay and listening.

1. The girls displayed consistent superiority to the boys in paragraph meaning and spelling, attaining significance in grade two in paragraph meaning and in grades two and three in spelling. The girls were significantly superior in word meaning in grade two with inconsistent results in grades one and three.

2. In reading, the girls achieved significant superiority in grades four, five and seven, and non-significant and declining superiority in grades six, eight, ten, eleven and twelve.

3. In the STEP test of writing, which resumbles tests of mechanics of language, the girls were superior at every grade level from grade four to twelve, and significantly so in all grades save grade nine.

4. In the essay test the girls achieved significant superiority at every grade level from grade four to grade twelve.

5. In the listening test no pattern of sex differences emerged as the sex differences were non-significant and completely inconsistent.

6. Differences in variability in communication test scores, while non-significant, favored the girls and indicated a major reversal not in keeping with research findings of greater male variability in achievement test scores.

CHAPTER SIX

SEX DIFFERENCES IN PERSONALITY, BEHAVIOR AND PHYSICAL TRAITS

The major interest in a consideration of sex differences among school children centers around intelligence and achievement. Intelligence, however, is a necessary but by no means sufficient condition for classroom learning. Nor is it solely responsible for differences in achievement. Cultural pressures, personality, the teacher and the school situation, among other factors, also affect an individual's performance in the classroom. Such factors, influenced by the sex of both the pupil and the teacher, increase the difficulty of analyzing and explaining sex differences. The present chapter discusses sex differences in personality and behavior and compares the incidence of stammering, enuresis, and impaired vision and hearing in boys and girls.

Personality and Behavior Factors

Personality and behavior are influenced by sex differences in growth and development. The obvious male tendency toward superiority in size, strength and motor ability encourages patterns of dominance, aggression and energetic behavior for males and contrasting behavior for females (Terman and Tyler, 1954). At the same time, society expects certain characteristic ways of behaving from each sex and inculcates in the growing child the sex role deemed appropriate to the culture. Differences in behavior are established very early in life. Hattwick (1937) investigated sixty behavior characteristics of several hundred nursery school children between the ages of two and four and a half. She located eleven traits which were predominantly masculine and sixteen feminine ones. The differences were statistically significant. To determine to what extent sex

traits actually observed in individuals were those that society expects them to have, Watson (1959) submitted Hattwick's twenty-seven traits to his college psychology classes for classification into masculine and feminine categories. He concluded from these studies that girls are timid and passive, that boys are forceful and aggressive, and that these are the characteristics which society expects the boy and girl to possess.

Cooperation begins at the preschool level and increases with the acquisition of communication skills (Wolfe and Wolfe, 1939). Maller (1929) tested various groups of children between the ages of eight and seventeen for cooperativeness and competitiveness. He concluded that girls were more cooperative in that they more often chose to work for a group than for themselves. Masculine traits of aggressiveness and competitiveness and their feminine counterparts, timidity and cooperativeness, are consciously and unconsciously developed and fostered in the children by their parents (Sears, Maccoby and Levin, 1957). Mothers treat sons and daughters differently. Girls are more warmly treated but are more often disciplined and subjected to withdrawal of love. They also receive more praise for good conduct. Boys receive more severe punishment but are allowed more opportunities for aggression. Anastasi (1958) refers to the greater agressiveness of the male as one of the most persistent sex differences noted. She attributes its cause partly to biological factors in that similar sex differences in aggression and fighting have been observed in the lower animals.

Terman and Tyler (1954) reported on 575 boys and 558 girls between the ages of nine and nineteen years. In the earlier years the boys exhibited the greater number of neurotic symptoms, but beginning

with adolescence and the onset of puberty, the girls became significantly more unstable. They concluded that clear-cut sex differences in emotional instability do not appear until adolescence. One of the more comprehensive investigations of the incidence of behavior problems in children was the California Guidance Study which MacFarlane, Allen and Honzik reported on in 1954. Two hundred fifty-two normal children, randomly selected, were under observation from the age of twenty-one months to fourteen years. Among the findings was a significantly greater incidence in males of behavior related to aggressiveness and competitiveness, including lying and stealing. Traits indicative of emotional instability were more often exhibited by girls. The authors reported that while most behavior problems decreased with age for both sexes and had almost disappeared by the age of fourteen, emotional instability was still in evidence at the upper age limit of the study and undoubtedly continued after the study had been completed.

MacFarlane and her associates listed lying and stealing among the predominantly masculine traits, but Terman (1925) rated his gifted boys higher in trustworthiness, and Hartshorne and May (1928) noted a tendency for girls to cheat more than boys. Teachers generally disclose less incidence of dishonesty, lying and cheating among girls (Freeman and Miles, 1950), and credit them with greater social orientation and participation.

Teachers' reactions to the pupils under their care and their relations with them are influenced by the personality and behavior of the pupils. In a study of teacher approval and disapproval of grade six pupils, DeGroat and Thompson (1949) found that pupils receiving the greatest teacher approval were those who had the best personality adjust-

ment, achieved the highest, and had the most intelligence. Because girls are more amenable to classroom routines and authority, and are more docile and less subjected to out-of-school attractions and distractions, their grades and ratings are improved, not only through the amount of material learned, but indirectly through the impression created on the teacher (Anastasi, 1958). Many investigators have proven that favoritism is shown the girls throughout the whole school period (Douglas and Olson, 1937; Day, 1938; Johnson, 1938; Lentz, 1929; Malpass, 1953). This favoritism, they maintained, accounts for much of the superiority shown by girls on teacher ratings of classroom achievement, particularly in the secondary grades.

There are discrepancies, too, between the attitudes of men and women toward aggressive behavior. Even though the role expectancy of the boy is that of aggressive forcefulness, Meyer and Thompson (1956) showed that grade six boys, because of their more aggressive behavior, received more disapproval than girls. The great majority of teachers are women with middle or lower-middle class backgrounds (Brim, 1958) who attempt to socialize the boys in school by means of dominative and aggressive behavior (Watson, 1959). According to Douglas and Olson (1937), and Johnson (1938), among others, this leads to more aggressiveness on the part of the boy, to more dissatisfaction, and to poorer achievement.

In summary, it is obvious that boys and girls exhibit many dissimilar personality and behavior traits. In interaction with the personality of the teacher and the classroom situation these influence the child's achievement, his grades, and his satisfaction or dissatisfaction with school. Studies point to the greater aggressiveness of

the boy and those forms of activity relating to it, including competitiveness, lying and stealing. Girls have been described as showing greater emotional instability, less aggressive behavior, and more cooperativeness. They also manifest a greater interest in social interaction and participation.

The boys and girls in the Clover Bar schools were rated by their teachers on the six behavior characteristics of social participation, aggressiveness, honesty, truthfulness, cooperativeness and emotional stability. A five point rating scale was designed as part of the Student Data Assembly Sheet (Appendix A) to indicate possession of the characteristic in amounts ranging from negligible through slight, average, above average and very marked. For analysis, the ratings given to each trait were classified by sex and grade and submitted to the χ^2 test of goodness of fit. Significance at the .05 level of confidence was accepted as the criterion of a real difference between the sexes. Traits in which the sexes differed significantly are shown in the accompanying table (Table XXIII).

The table shows clearly that the teachers tended to rate the girls more favorably than the boys. In the traits of social participation, honesty, truthfulness and cooperation, the girls received nineteen significantly more favorable ratings than the boys. In those ratings not shown, in which the differences were negligible and could have occurred as a result of chance factors in sampling, the trend toward more favorable female ratings continued. In no grade were the boys rated higher than the girls in cooperation; only in grade ten were they considered slightly more truthful; and in grade one a little more honest. These findings tend to support the conclusion reported in the literature by Freeman and

TABLE XXIII

SIGNIFICANT DIFFERENCES BY GRADE BETWEEN CLOVER BAR BOYS AND GIRLS ON SIX BEHAVIORAL TRAITS AS RATED BY CLASSROOM TEACHERS

GRADE	1	2	3	4	5	6	7	8	9	10	11	12
Social Participation							.05(G)[a]	.05(G)		.05(G)		
Aggression	.01(B)[b]	.05(B)		.05(B)	.05(G)		.05(G)		.05(B)			
Honesty					.05(G)		.01(G)	.05(G)		.05(G)		.01(G)
Truthfulness				.05(G)			.01(G)	.05(G)				.01(G)
Cooperation		.01(G)		.01(G)			.01(G)	.01(G)	.05(G)		.01(G)	.05(G)
Emotional Stability				.01(G)	.05(G)	.05(G)	.01(G)	.05(G)		.05(G)		

[a] A significant difference favoring the girls at the .05 level.

[b] A significant difference favoring the boys at the .01 level.

Miles (1950), MacFarlane, Allen and Honzik (1954), Wolfe and Wolfe (1939), and Maller (1929), and partially confirm the fifth hypothesis of this study.

Contrary to the view of Terman and Tyler (1954) that girls lose their superiority in social participation in the later school years, the Clover Bar data not only suggest a greater social participation by girls throughout the high school years, but reveal that they engage in significantly more social activities in grades seven, eight and ten than do the boys of these grades. Ratings by the Clover Bar teachers, however, were in agreement with those of other teachers reported in similar studies by Freeman and Miles (1950).

Male predisposition toward aggressive tendencies was borne out

by the Clover Bar findings which were also consistent with the hypothesis formulated to give direction to this section of the present study. This trait, however, proved not as consistently masculine as previous studies have reported. The girls were rated by their teachers as being significantly more aggressive, at the .05 level of confidence, in grades five and seven, and just barely more aggressive in grades ten and eleven. The boys received significantly higher ratings only in grades one, two, four and nine.

The hypothesis of a greater female emotional instability was not supported by the Clover Bar findings. Contrary to reports of Anastasi (1958), Terman and Tyler (1954), and Hartshorne, May and Maller (1929), the teachers rated the Clover Bar girls significantly more stable, especially in those grades which correspond to the age period in which prepuberal and puberal disturbances are felt to occur. The weight of contradictory evidence in the literature suggests the influence of other factors on teacher ratings. It is not known to what extent a 'halo effect' (Terman and Tyler, 1954; Terman, 1925) was operating to provide a favorable overall rating for the girls, nor the degree to which a female sex bias (Anastasi, 1958) influenced the judgment of the teachers.

Stammering

Studies are fairly conclusive that boys have more difficulties in the area of speech than girls. Many workers relate speech defects of all kinds, including stammering, to the greater prevalence of reading disability among boys. They also credit the greater verbal fluency of the girls with creating a negative psychological reaction in boys. Bennett (1938) made an inquiry into the cause of poor reading and con-

cluded that boys are not as mature as girls when beginning reading and are therefore frustrated and emotionally upset when they fail to keep up. McCarthy (1952) also felt that the boys' lag in language development caused stammering and reading disability. Because boys have more outdoor activities they have less opportunity than girls for conversation with their parents. They enter school at a disadvantage and have difficulty competing with the girls.

Laycock (1954) listed five to ten school children in every thousand as stammerers. Heltman (1943) gave the number as ten in every thousand for the general population, including the high schools. Heltman also considered grades four, five and six as the periods of greatest frequency of stuttering among school children. He reported twice as many stutterers in grade five as in grade one. Investigators agree that more boys than girls are stammerers, but they do not agree on the relative numbers. Schuell (1946) found an incidence of 4.8 to 1 of boys over girls in the files of the speech clinics at the State University of Iowa. He noted, too, that there were increasingly more males in proportion to females with increase in age. In their work with stutterers among school children, Louttit and Hall (1936) could discover no consistency in variations in the male-female ratio from grades one to ten, but in each grade group there were more boys than girls. Child Guidance Clinics across Canada gave the sex ratio for sutterers and stammerers during the period 1953-55 as two or three to one of boys over girls. Louttit's (1957) summary of the research reporting the incidence of stammering and stuttering in the general population included differences in the male-female ratio ranging from two to one to ten to one.

The incidence of stammering in the Clover Bar population was slight. Thirty-eight boys and twelve girls were listed as suffering from this speech defect. The ratio of 3.2 to 1 of boys over girls was in keeping with the sex ratio reported in other studies and upheld the hypothesis of more male than female stammerers in the Clover Bar school population.

Enuresis

The hypothesis of a larger number of male enuretics among Clover Bar school children was also tentatively supported by the Clover Bar data. In the MacFarlane, Allen and Honzik (1954) study of behavior problems among children twenty-one months to fourteen years of age, significant sex differences in the incidence of enuresis were not noted although the boys tended to be slightly more enuretic than the girls. No noticeable differences in nursery school children were reported by Hattwick (1937), but Terman's (1925) six hundred gifted children included twenty enuretic boys and five enuretic girls. Most studies agree with Terman that the incidence of enuresis is greater among boys. Diller (1951) gave the ratio of enuretic boys to girls as 2.5 to 1, Kanner (1950) as 1.6 to 1, and the *Annual Report of the Vancouver Child Guidance Clinic* for 1953-55 stated the ratio as 1.5 to 1.

For the Clover Bar survey, a child was classed as enuretic if he consistently wet the bed at least twice a week beyond the age of four years. To the extent that the memories of the older students served them accurately, the data indicate a somewhat greater number of male enuretics. The ratio of 1.7 to 1 appears to be fairly close to those reported in other school populations. Of the 137 boys reporting themselves as having been

enuretic, 115 were distributed fairly evenly throughout the first seven grades. The 74 enuretic girls were scattered unequally among grades one to eight. While the largest numbers for the boys appeared in grades one, three and five, no evidence of any particular age or grade pattern was apparent for the girls.

Impaired Vision and Hearing

Information on sex differences in impaired vision and hearing is seldom reported on for children who are educable in the regular classroom (Louttit, 1957). Comparative data on these physical defects for the general school population are therefore not provided. It may be said generally, however, that hearing disability and, to a lesser degree, seeing disability, are related to speech problems, reading, spelling, school retardation and behavior problems. Increased frustration and emotional instability often occur with physical handicaps. So also do personality problems occur that are peculiar to each type of deficiency. These factors affect an individual's development and achievement regardless of his sex.

The number of pupils suffering from visual defects and hearing loss in the Clover Bar schools was very slight. Fifty girls and forty boys had a visual defect that had not been corrected, while sixteen boys and nine girls were reported with an uncorrected hearing disability. The number of children of either sex with defective vision and hearing was too small to confirm or deny the hypothesis of greater vision defects among girls and more hearing difficulties among boys.

Summary

The Clover Bar students were rated by their teachers on six behavior traits. In general, teacher ratings were in keeping with the findings of previous studies although contradictions occurred. The girls received higher ratings, many at the level of significance, on social participation, honesty, truthfulness and cooperation. While the finding of a greater social participation by the girls does not agree with those of Terman and Tyler (1954), and the higher degree of honesty among girls is in disagreement with Hartshorne, May and Maller's (1929) study, support for greater female possession of the above four traits is provided by Freeman and Miles' (1950) general summary of the research. Teacher ratings, indicating a greater masculine agressiveness, were fairly consistent with research findings (Anastasi, 1958; Hartshorne, May and Maller, 1929), whereas the conclusion of the teachers that the girls were definitely more stable emotionally than the boys is in direct opposition to the research (Terman and Tyler, 1954; Hartshorne, May and Maller, 1929; Anastasi, 1958). This may be explained by the fact that teacher ratings tend to favor the girls no matter what is rated (Douglas and Olson, 1937; Day, 1938; Malpass, 1953; Meyer and Thompson, 1956). This would suggest that a better mode of measuring stability should have been employed.

The incidence of stammering (3.2 to 1) and of enuresis (1.7 to 1) both showed more boys suffering from these defects. This confirms the findings of previous research (McCarthy, 1952; Bennett, 1938; Louttit and Hall, 1936; Terman, 1925; Diller, 1951). Fifty girls and forty boys were found to have a vision impairment that had not been corrected, and

sixteen boys and nine girls had an uncorrected hearing disability. The numbers were too small to be indicative of any sex difference.

Conclusions

Briefly, the conclusions drawn from a consideration of the sex differences relating to the above miscellany of characteristics may be listed as follows:

1. The girls were rated by their teachers as being more honest, truthful, and cooperative; they were also considered more emotionally stable and more active in social participation.

2. The boys were rated higher on aggressive tendencies except in grades five and seven, in which grades the girls were considered significantly more aggressive.

3. The incidence of stammering and of enuresis was higher among the boys.

4. There was no evidence of any sex differences in impaired vision and hearing.

CHAPTER SEVEN

CONCLUSIONS AND DISCUSSION OF THE FINDINGS

Test scores of 2,799 boys and girls have been analyzed to reveal sex differences in intelligence and achievement. The subjects were the regularly enrolled school population of a school division in north central Alberta. Tests were administered in March, 1958, to the 1,441 boys and 1,358 girls in grades one to twelve. The Stanford Achievement Test Battery, Primary and Intermediate Forms, the Cooperative Sequential Tests of Educational Progress, the Otis Quick Scoring Mental Ability Tests, and the Cooperative School and College Ability Tests were used in the testing program. Personal data were also gathered which permitted sex comparisons on several personality and behavior traits, stammering, enuresis, and impaired vision and hearing.

Conclusions

1. The girls were significantly superior on Otis I.Q. mean scores in grades four, five and seven and almost so in grade six. This period corresponds closely with the prepuberal period in which female growth is accelerated. Prior to grade four and after grade seven the differences, while favoring the girls in all grades save nine, were non-significant. The SCAT Total scores confirmed this finding in grades five and seven and, to a lesser degree, in grade four.

2. No significant differences appeared in the three sets of Otis scores for grades one, two and three, although the girls showed a slight superiority in non-verbal and total scores.

3. The girls were significantly superior in SCAT Verbal scores in grade four. Thereafter there were no significant differences between

scores. It is to be recalled that there were no significant differences in Otis Verbal scores in grades one, two and three (Fig. 2). There was no tendency for one sex to be superior to the other in verbal mean scores for grades one to three and five to twelve.

4. There was evidence of a trend toward female superiority in quantitative thinking in grades four to seven. In grades eight, nine and ten the situation was reversed with the trend favoring the boys.

5. On SCAT Total scores the girls were significantly superior in grades five and seven and almost so in grade four, while the boys were significantly superior in grade nine. Thereafter the differences were non-significant and tended to diminish. It will be noted that female superiority again appeared in the period of the prepuberal growth spurt as in the case of the mean Otis scores (Fig. 1).

6. A significant difference favoring the girls was found in computation scores in grade two with a trend toward female superiority in grade three.

7. Significant differences in mathematics scores favoring the boys were found in grades nine, ten and twelve, with the difference almost attaining significance in grade eleven. Differences before grade nine were inconsistent and non-significant.

8. The boys proved significantly superior in science scores in grades six, nine, ten, eleven and twelve.

9. The girls were significantly better in social studies at the grade seven level. Thereafter the boys showed a consistent trend toward superiority, attaining significance at the grade twelve level. The differences between the sexes in grades four, five and six were

slight but favored the boys.

10. Throughout the data for mathematics and science and, to a lesser degree, for social studies, there was a common pattern of early similarity and inconsistency of achievement for the two sexes followed by fairly consistent male superiority at the level of significance or near significance from grade nine in mathematics and science, and from grade seven in social studies, through grade twelve.

11. The girls displayed consistent superiority to the boys in paragraph meaning and spelling, attaining significance in grade two in paragraph meaning and in grades two and three in spelling. The girls were significantly superior in word meaning in grade two with inconsistent results in grades one and three.

12. In reading, the girls achieved significant superiority in grades four, five and seven, and non-significant and declining superiority in grades six, eight, ten, eleven and twelve.

13. In the STEP test of writing, which resembles tests of mechanics of language, the girls were superior at every grade level from grade four to twelve, and significantly so in all grades save grade nine.

14. In the essay test the girls achieved significant superiority at every grade level from grade four to grade twelve.

15. In the listening test no pattern of sex differences emerged as the differences were non-significant and completely inconsistent.

16. The sexes showed approximately equal variability in intelligence and achievement test scores. Differences, for the most part, were non-significant. What differences that did appear were more marked in the boys' than in the girls' scores.

17. Girls were rated by their teachers as being more honest,

truthful and cooperative than the boys; they were also considered more emotionally stable and more active in social participation.

18. The boys received higher ratings in aggressive tendencies at the level of significance or near significance in eight of the twelve grades, while the girls were considered significantly more aggressive in grades five and seven, and just barely more aggressive in grades ten and eleven.

19. The incidence of both stammering and enuresis was higher among the boys.

20. There were no sex differences in the incidences of impaired vision and hearing.

Discussion of the Findings

Nine aspects of the findings require further discussion with a view to discovering a theoretical basis which will reconcile them with our existing body of knowledge.

1. The Over-all Superiority of the Girls in Language. The girls were superior in mechanics of language (STEP Writing) in all grades from four to twelve, falling short of significance only in grade nine. In essay writing (STEP Essay) the girls were significantly superior in every grade from four to twelve. These findings are consistent with existing research (McCarthy, 1954; Stroud and Lindquist, 1942; Traxler and Spaulding, 1954), and seem to indicate a culturally and even biologically based tendency toward a social orientation and communication which is greater than that found in boys.

2. The Early but Diminishing Superiority of Girls in Reading. The girls

were significantly superior to the boys in reading in grades four, five and seven, and showed a trend toward superiority in grades six, eight and eleven. The pattern seems to be one of early superiority which falls below the level of significance by grade eight and continues at this level through grade twelve. It might be argued that reading at the higher grade levels demands knowledge and skills beyond those expected under the hypothesis of a greater feminine drive toward social orientation and communication. Certain it is that the Clover Bar pattern of declining superiority in girls' reading is supported by existing research of Stroud and Lindquist (1942) and independently by Anderson (1949).

3. The Pattern of Increasing Superiority of Boys in Mathematics. From grades four to eight no significant nor consistent pattern of sex differences appeared. The boys were significantly superior in grades nine, ten and twelve, and just short of significance in grades eight and eleven. This pattern of increasing male superiority is supported by the studies of Sweeney (1953), Stroud and Lindquist (1942), Terman and Tyler (1954) and McNemar (1942). It has been argued that this is the result of a greater male competence in reasoning, problem solving and abstract thinking. Terman (1925), however, contends that diverging interests and activities result in higher test scores for boys in activities where numerical and quantitative thinking are required. It is also suggested that culturally imposed sex roles are likely to be present.

4. The Pattern of Increasing Male Superiority in Science. The boys demonstrated significant superiority in science scores in grades six, nine, ten, eleven and twelve, revealing a pattern of increasing masculine

superiority in achievement in science. This finding is widely supported by the research of Jordan (1937), Learned and Wood (1955), Anastasi (1958) and Scheinfeld (1943). The rationale suggested above by Terman of diverging interests and activities consistent with culturally imposed sex roles seems adequate.

5. The Inconclusive Pattern of Sex Differences in Social Studies. The boys were significantly superior to the girls only in grade twelve. The girls were significantly superior only in grade seven. The pattern displayed by Figure 14, however, indicates a tendency toward male superiority from grade nine through grade twelve. This supports the research of Anastasi (1958), Osborne (1939) and Traxler and Spaulding (1954). Anastasi (1958) feels that cultural factors such as less restricted environment or less restricted range of reading interests may account for this situation.

6. An Apparent Irregularity in Intelligence Scores. The girls proved significantly superior on Otis I.Q. scores in grades four, five and seven. They were also significantly superior in grade seven on SCAT Quantitative scores, and again in grade seven on SCAT Total scores. This suggests a somewhat definite tendency toward intellectual superiority of girls in the prepuberal period which has not appeared in other studies and could have been a result of a limited or biased sample. Certainly nothing in the achievement scores supports this finding of prepuberal female superiority. It is a finding which is to be noted, although it cannot be reconciled with the definitive studies in this field.

7. The Apparent Contradiction Relating to Verbal Intelligence. The SCAT Verbal scores show no significant sex differences save at the grade four level. At other levels the sexes show negligible differences favoring neither boys nor girls. This is consistent with the hypothesis of sex equality in intelligence but at variance with the findings on achievement in language. The greater facility of the girls in language mechanics and expression seems to result from their greater concern for social orientation and communication without the necessity for innate superiority in verbal intelligence.

8. The Absence of Pattern in the Listening Test. No significant nor consistent pattern of sex differences in listening emerged from this study. Such differences as did appear favored each of the sexes in turn with the girls superior in grades four, five, seven, eight, eleven and twelve, and the boys in grades six, nine and ten. Since the research on 'listening' is limited and the test used a new one, this finding must await further exploration of both subject and testing instrument.

9. Miscellaneous Findings. a) The girls were rated by their teachers as more honest, truthful, cooperative, more emotionally stable, and more active in social participation. These findings are in harmony with previous research save for the finding on emotional stability and to a lesser degree on truthfulness. When we realize that the study was limited to rating by teachers, and that there is excellent research evidence by Douglas and Olson (1937), Day (1938), Malpass (1953), and Anastasi (1958), supporting the conclusion that teachers of both sexes tend to rate girls more highly than boys, these departures from the

findings of previous research are not unexpected. The finding that boys were generally rated as more aggressive than girls confirms earlier reports of Hattwick (1937), Terman and Tyler (1954) and Anastasi (1958).

b) The incidence of stammering and enuresis was higher for boys than for girls, a finding which agrees with earlier studies.

c) The incidence of impaired vision and hearing revealed no sex differences, a finding supported by earlier research.

BIBLIOGRAPHY

BIBLIOGRAPHY

A

Anastasi, Anne. Differential Psychology (3rd ed.). New York: Macmillan Company, 1958.

Anderson, Irving H. "Individual Differences in Reading Achievement." The University of Michigan School of Education Bulletin, XXI: 17-20, 1949.

Anderson, Irving H. and Dearborn, Walter F. The Psychology of Teaching Reading. New York: The Ronald Press, 1952.

Anderson, Irving H., Hughes, Byron O. and Dixon, W. Robert. "Age of Learning to Read and Its Relation to Sex, Intelligence and Reading Achievement in the Sixth Grade." Journal of Educational Research, 49: 447-453, 1956.

B

Bennett, C. C. "An Inquiry into the Genesis of Poor Reading." Contributions to Education, No. 755. New York: Teachers College, Columbia University, 1938.

Bennett, G. K., Seashore, H. G. and Wesman, A. G. Differential Aptitude Tests: Manual (2nd ed.). New York: Psychological Corporation, 1952.

Book, W. F. and Meadows, J. L. "Sex Differences in 5925 High School Seniors in Ten Psychological Tests." Journal of Applied Psychology, 12: 56-81, 1928.

Brim, Orville G., Jr. Sociology and the Field of Education. New York: Russell Sage Foundation, 1958.

Brown, Moroni H. and Bryan, G. Elizabeth. "Sex as a Variable in Intelligence Test Performance." Journal of Educational Psychology, 48: 273-278, 1957.

Buckingham, B. R. and MacLatchey, J. "The Number Abilities of Children When They Enter Grade One." Twenty-Ninth Yearbook, National Society for the Study of Education (II), 473-549, 1930.

Burton, M. "The Hearing and Reading Comprehension of Vocabulary among High School Seniors." School Review, 52: 47-50, 1944.

C

Caffrey, John. "Auding." Review of Educational Research, 25: 121-138, 1955a.

Caffrey, John. "Auding Ability at the Secondary Level." Education, 75: 303-310, 1955b.

Carroll, Marjorie W. "Sex Differences in Reading Readiness at the First Grade Level." Elementary English, 25: 370-375, 1948.

Carter, Robert Scriven. "How Invalid Are Marks Assigned by Teachers?" Journal of Educational Psychology, 43: 218-228, 1952.

Clark, William W. "Boys and Girls—Are There Significant Ability and Achievement Differences?" Phi Delta Kappan, Vol. XLI, No. 2, pp. 73-76, 1959.

Climenhaga, Clarence Eugene. A Survey of Arithmetical Achievement of Grade Eight Pupils in Alberta Schools. Unpublished Master's Thesis. University of Alberta, Edmonton, Alberta, 1955.

Coull, William Hendry. A Normative Survey of Reading Achievement of Alberta Children in Relation to Intelligence, Sex, Bilingualism and Grade Placement. Unpublished Master's Thesis. University of Alberta, Edmonton, Alberta, 1956.

Cronbach, Lee J. Essentials of Psychological Testing. New York: Harper and Bros., 1949.

D

Day, L. C. "Boys and Girls and Honor Ranks." The School Review, 47: 289-299, 1938.

DeGroat, A. F. and Thompson, G. G. "A Study of the Distribution of Teacher Approach and Disapproval among Sixth Grade Children." Journal of Experimental Education, 18: 57-75, 1949.

Diller, Juliet C. "The Sex Factor in Enuresis." Journal of Child Psychiatry, 2: 194-204, 1951.

Dolch, Edward W. The Psychology and Teaching of Reading. New York: Ginn and Company, 1931.

Douglas, Harl R. and Olson, Newman E. "The Relation of High School Marks to Sex in Four Minnesota High Schools." The School Review, 45: 283-288, 1937.

Dunlop, Florence S. "Analysis of Data Obtained from Ten Years of Intelligence Testing in the Ottawa Public Schools." Canadian Journal of Psychology, Vol. I, No. 2, 87-91, 1947.

E

Edgerton, H. A. and Britt, S. H. "Sex Differences in the Science Talent Test." Science, 100: 192-193, 1944.

Edgerton, H. A. and Britt, S. H. "Technical Aspects of the Fourth Annual Science Talent Search." Educational and Psychological Measurement, 7: 3-21, 1947.

Ellis, Robert Sydney. The Psychology of Individual Differences. New York: D. Appleton-Century Company, 1942.

F

Freeman, Frank N. and Flory, Charles D. "Growth in Intellectual Ability." In Barker, Roger G., Kounin, Jacob S. and Wright, Herbert F. (Eds.), Child Behavior and Development. New York: McGraw-Hill Book Company, Inc., 1943.

Freeman, Frank S. and Miles, Catherine C. "Sex Differences." In Monroe, Walter S. (Ed.), Encyclopedia of Educational Research (rev. ed.). New York: Macmillan Company, 1950.

Furness, Edna Lue. "Listening: A Case of Terminological Confusion." Journal of Educational Psychology, 48: 477-482, 1957.

G

Getman, G. N. In the American Optometric Association Report carried by the United Press, Chicago, April 15, 1950.

Goodenough, Florence E. Measurement of Intelligence by Drawings. Yonkers-on-Hudson: World Book Company, 1926.

Goodenough, Florence E. "The Consistency of Sex Differences in Mental Traits at Various Ages." Psychological Review, 34: 440-462, 1927.

Goolishan, A. R. and Foster, T. "A Note on Sex Differences on the W-B Test." Journal of Clinical Psychology, 10: 298-299, 1954.

Grossnickle, F. E. "Concepts in Social Arithmetic for the Eighth Grade Level." Journal of Educational Research, 12: 102-122, 1937.

H

Hartshorne, H. and May, M. A. Studies in Deceit. New York: Macmillan, 1928.

Hartshorne, H., May, M. A. and Maller, J. B. Studies in the Nature of Character. Vol. II. Studies in Service and Self Control. New York: Macmillan, 1929.

Hattwick, LaBerta A. "Sex Differences in Behavior of Nursery School Children." Child Development, 8: 343-355, 1937.

Havighurst, R. J. and Breese, F. H. "Relations between Ability and Social Status in a Midwestern Community: III. Primary Mental Abilities." Journal of Educational Research, 38: 244-247, 1947.

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[illegible]

[illegible]

[illegible]

Heilman, J. D. "Sex Differences in Intellectual Abilities." Journal of Educational Psychology, 24: 47-62, 1933.

Heltman, Harry Joseph. First Aid for Stutterers. Boston: Expression Company, Publishers, 1943.

Herzberg, Frederick and Lapkin, Milton. "A Study of Sex Differences on the Primary Mental Abilities Test." Educational and Psychological Measurement, 14: 687-698, 1954.

Hobson, J. R. "Sex Differences in Primary Mental Abilities." Journal of Educational Research, 41: 126-132, 1947.

Hook, J. N. The Teaching of High School English (2nd ed.). New York: The Ronald Press Company, 1959.

I

Irvine, C. E. "Evaluating a Training Program in Listening for College Freshmen." School Review, 61: 25-29, 1953.

J

Johnson, George R. "Girls Do Better in School Than Boys." School and Society, 41: 313-314, 1938.

Jordan, A. M. "Sex Differences in Mental Traits." High School Journal, 20: 254-261, 1937.

K

Kanner, L. Child Psychiatry (2nd ed.). Springfield, Ill.: Charles C. Thomas, 1950.

Kuznets, G. M. and McNemar, Olga. "Sex Differences in Intelligence Test Scores." Thirty-Ninth Yearbook, National Society for the Study of Education (I), 211-220, 1940.

L

Larsen, R. P. and Feder, D. D. "Common and Differential Factors in Reading and Hearing Comprehension." Journal of Educational Psychology, 31: 241-252, 1940.

Laycock, S. R. Teaching and Learning. Toronto: The Copp Clark Co. Ltd., 1954.

Learned, W. S. and Wood, B. D. "The Student and His Knowledge." Carnegie Foundation, Advanced Teaching Bulletin, No. 29, 1938.

Lentz, T. F. "Sex Differences in School Marks with Achievement Test Scores Held Constant." School and Society, 29: 65-68, 1929.

Lewis, W. D. "Sex Distribution of Intelligence among Inferior and Superior Children." Journal of Genetic Psychology, 67: 67-75, 1945.

Lincoln, E. A. Sex Differences in the Growth of American School Children. Baltimore: Warwick and York, 1927.

Louttit, C. M. Clinical Psychology of Exceptional Children (3rd ed.). New York: Harper and Bros., 1957.

Louttit, C. M. and Halls, Emily C. "The Indiana Speech Survey." Journal of Speech Disorders, 1: 73-80, 1936.

M

McCarthy, Dorothea. "Some Possible Explanations of Sex Differences in Language Development and Disorders." Journal of Psychology, 35: 155-160, 1952.

McCarthy, Dorothea. "Language Development in Children." In Carmichael, Leonard (Ed.), Manual of Child Psychology (2nd ed.). New York: John Wiley and Sons, Inc., 1954.

MacFarlane, Jean W., Allen, Lucille and Honzik, Marjorie P. A Developmental Study of the Behavior Problems of Normal Children between Twenty-One Months and Fourteen Years. Berkeley, Calif.: University of California Press, 1954.

McLaren, V. M. "Socio-economic Studies and Reading Ability--A Study in Infant Reading." Studies in Reading, Vol. 2. (Compiled by W. D. Ritchie.). London: University of London Press, 1950.

McNemar, Quinn. The Revision of the Stanford Binet Scale. New York: Houghton Mifflin Company, 1942.

McNemar, Q. and Terman, L. M. "Sex Differences in Variational Tendency." Genetic Psychological Monographs, 18: 1-65, 1936.

Maller, J. B. "Cooperation and Competition: An Experimental Study of Motivation." Contributions to Education, No. 384. New York: Teachers College, Columbia University, 1929.

Malpass, Leslie F. "Some Relationships between Students' Perception of School and their Achievement." Journal of Educational Psychology, 44: 475-482, 1953.

Meyer, William J. and Thompson, George G. "Sex Differences in the Distribution of Teacher Approach and Disapproval among Sixth Grade Children." Journal of Educational Psychology, 47: 388-396, 1956.

Moore, J. E. "Sex Differences in Speed of Reading." Journal of Experimental Education, 8: 110-114, 1939.

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Morgan, A. B. "Sex Differences in Adults on a Test of Logical Reasoning." Psychological Reports, 2: 227-230, 1956.

N

Newland, T. E. and Lawrence, W. C. "Chicago Non-Verbal Examination Results on an East Tennessee Negro Population." Journal of Clinical Psychology, 9: 44-46, 1953.

O

Olson, Willard C. Child Development. Boston: D. C. Heath and Company, 1949.

Osborne, L. G. "Relative Difficulty of High School Subjects." School Review, 47: 95-100, 1939.

P

Pauley, Frank R. "Sex Differences and Legal School Entrance Age." Journal of Educational Research, 45: 1-9, 1951.

Penty, Ruth C. Reading Ability and High School Dropouts. New York: Bureau of Publications, Teachers College, Columbia University, 1956.

Pintner, Rudolph. "Results Obtained with the Non-Language Group Test." Journal of Educational Psychology, 15: 473-483, 1924.

Potter, M. C. "Perception of Symbol Orientation and Early Reading Success." Contributions to Education, No. 939. New York: Teachers College, Columbia University, 1949.

Prescott, George A. "Sex Differences in Metropolitan Readiness Tests." Journal of Educational Research, 48: 605-610, 1955.

Pressey, L. W. "Sex Differences Shown by 2544 School Children on a Group Test of Intelligence, with Special Reference to Variability." Journal of Applied Psychology, 2: 323-340, 1918.

Q

R

de Ridder, Lawrence M. "Comparative College Success of Men and Women." School and Society, 75: 9-11, 1952.

Rigg, M. G. "The Relative Variability in Intelligence of Boys and Girls." Journal of Genetic Psychology, 56: 211-214, 1940.

[illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Roberts, J. A. F., Norman, R. M. and Griffith, R. "Studies on Child Population." Reported by Terman, L. M. and Tyler, Leona E. in "Psychological Sex Differences" in Carmichael, Leonard (Ed.), Manual of Child Psychology (2nd ed.). New York: John Wiley and Sons, Inc., 1954.

S

Samuels, F. "Sex Differences in Reading Achievement." Journal of Educational Research, 36: 594-603, 1943.

Scheinfeld, Amram. Women and Men. New York: Harcourt and Brace, 1943.

Schuell, H. "Sex Differences in Relation to Stuttering." Part I. Journal of Speech Disorders, 11: 277-298, 1946.

Scottish Council for Research in Education. The Intelligence of Scottish Children: A National Survey of an Age Group. Pub. No. V. London: University of London Press, 1933.

Scottish Council for Research in Education. Intelligence of a Representative Sample of Scottish Children. Pub. No. XV. London: University of London Press, 1939.

Scottish Council for Research in Education. The Trend of Scottish Intelligence. Pub. No. XXX. London: University of London Press, 1949.

Sears, R. R., Maccoby, Eleanor E. and Levin, H. Patterns of Child Rearing. Evanston, Ill.: Row, Peterson, 1957.

Seashore, H., Wesman, A. and Doppelt, J. "The Standardization of the Wechsler Intelligence Scale for Children." Journal of Consulting Psychology, 14: 99-110, 1950.

Stagner, Ross and Karwoski, T. F. Psychology. New York: McGraw-Hill Book Company, Inc., 1952.

Strange, C. and Palmer, W. "A Note on Sex Differences on the W-B Test." Journal of Clinical Psychology, 9: 85-87, 1953.

Strickland, Ruth G. "The Language and Mental Development of Children." Bulletin of the School of Education, Indiana University, Vol. XXIII, No. 2, 1947.

Stroud, J. B. and Lindquist, E. F. "Sex Differences in Achievement in the Elementary and Secondary Schools." Journal of Educational Psychology, XXXIII: 657-667, 1942.

Summerskill, J. and Darling, C. D. "Sex Differences in Adjustment to College." Journal of Educational Psychology, 46: 355-361, 1955.

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[illegible]

[illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Sweeney, E.J. Sex Differences in Problem Solving. Report No. 1 Contract N6-O.N.R.-25125, Stanford University, Calif., 1953.

T

Terman, L.M., et al. Genetic Studies of Genius: Vol. I. Mental and Physical Traits of a Thousand Gifted Children. Stanford: Stanford University Press, 1925.

Terman, L.M., et al. "Psychological Sex Differences." In Carmichael, Leonard (Ed.), Manual of Child Psychology. New York: John Wiley and Sons, Inc., 1946.

Terman, L.M. and Merrill, Maud A. Measuring Intelligence. New York: Houghton Mifflin Company, 1937.

Terman, L.M. and Tyler, Leona E. "Psychological Sex Differences." In Carmichael, Leonard (Ed.), Manual of Child Psychology (2nd ed.). New York: John Wiley and Sons, Inc., 1954.

Traxler, Arthur E. "Some Data on the Results of the Sequential Tests of Educational Progress (STEP), Level 3, Form A, for Small Groups of Pupils in Two Independent Schools for Girls." Education Record Bulletin, No. 2, 69-73, 1958.

Traxler, Arthur E. and Spaulding, Geraldine. "Sex Differences in Achievement of Independent School Pupils as Measured by Stanford Achievement Test, Form K." Education Record Bulletin, 63: 69-80, 1954.

Tyler, Leona E. The Psychology of Human Differences (2nd ed.). New York: Appleton-Century-Crofts, Inc., 1956.

U

V

Vernon, Philip E. The Structure of Human Abilities. London: Methuen and Co. Ltd., 1950.

Vineyard, E.E. "A Longitudinal Study of the Relationship of Differential Aptitude Test Scores with College Success." Personnel and Guidance Journal, 36: 413-416, 1958.

W

Watson, Robert I. Psychology of the Child. New York: John Wiley and Sons, Inc., 1959.

Watts, A.F. The Language and Mental Development of Children. London: George G. Harrap and Co., Ltd., 1944.

Wechsler, David. The Measurement of Adult Intelligence (3rd ed.). Baltimore: The Williams and Wilkins Company, 1944.

Wesman, A.G. "Separation of Sex Groups in Test Reporting." Journal of Educational Psychology, 40: 223-229, 1949.

Witty, P.A. "A Genetic Study of Fifty Gifted Children." Thirty-Ninth Yearbook, National Society for the Study of Education (II), 401-409, 1940.

Wolfe, D.L. and Wolfe, Helen M. "The Development of Cooperative Behavior in Monkeys and Young Children." Journal of Genetic Psychology, 55: 137-175, 1939.

Woody, C. "The Arithmetical Background of Young Children." Journal of Educational Research, 24: 188-201, 1931.

Wright, Mary J. Sex Differences in Children. (Mental Health Division, Department of National Health and Welfare, Ottawa, March, 1956.)

X

Y

Z

APPENDIX

CLOVER BAR SCHOOL SURVEY

Under the Sponsorship of the Chairman and the Boara of Trustees of the Clover Bar School Division

STUDENT DATA ASSEMBLY SHEET

DIRECTION

Mr. L. A. Walker, Superintendent of Schools for the Clover Bar School Division.

Dr. H. Siemens, Medical Health Officer, Leduc-Strathcona Health Unit.

Mr. E. J. Kibblewhite, Welfare Officer, Leduc-Strathcona Health Unit.

Mr. J. A. MacDougall, Supervisor of Mental Hygiene for the Schools, Leduc-Strathcona Health Unit.

◆

CONSULTANTS

Dr. G. M Dunlop, Chairman, Division of Educational Psychology, Faculty of Education, University of Alberta.

Dr. D. B. Black, Associate Professor, Division of Educational Psychology, Faculty of Education, University of Alberta.

CLOVER BAR SURVEY - 1958

Under the Sponsorship of the Board of the
Clover Bar School Division Number 13

DO NOT MARK IN THIS COLUMN

No. 1-6

I. IDENTIFYING DATA:

1. Name: .... Sex: M ....; F ....
(Surname) (First Name and Initial)

2. Age: Years .... Months .... Grade ....

3. Home: Edmonton .... Town or Village .... Farm .... 25. ....

4. (a) Ethnic Stock: 1. Birthplace .... 26. ....

2. Birthplace of Father .... 27. ....

3. Birthplace of Mother .... 28. ....

(b) Lauguage(s) spoken in home 1. .... 2. .... 29. ....

II. FAMILY:

1. Father living: Yes .... No ....

2. Mother living: Yes .... No .... 30. ....

3. Both parents living in the home: Yes .... No ....

4. If parents not living together check the following:

(a) parent absent, Mother .... Father ....

(b) cause, deceased ....; divorced ....; separated ....; other.......... 31. ....

5. Number of Brothers and Sisters .... 32. 33.

6. Are parents gainfully employed? Father Yes .... No .... 34. ....

Mother Yes .... No ....

7. Length of residence in locality: less than one year ....; 1 year ....; 2 years ....;

3 years ....; 4 or more years .... 35. ....

8. Ownership of home: Yes .... No .... 36. ....

9. Ownership of car: Yes .... No .... 37. ....

10. Ownership of TV: Yes .... No .... 38. ....

DO NOT
MARK
IN THIS
COLUMN

. EDUCATIONAL:

1. Age at school entrance .... , ...;
Years Months
39. .... 40. ....

2. Normal progress ....; 41. ....

3. Retarded: Yes .... 4. If so, how many years .... 42. ....

5. In what grade or grades? .... 43. .... 44. ....

6. Accelerated: Yes .... No .... 7. If so, how many times .... 45. ....

8. In what grade or grades? .... 46. .... 47. ....

9. How many times has the family moved from one school district or division to another during the child's school attendance .... 48. ....

10. Number of days absent from school since Sept. 1, 1957 .... 49. .... 50. ....

. ECONOMIC:

1. Occupation of Father .... (farmer, oil field worker, factory or industrial worker; teacher, manager, small proprietor, large proprietor; office worker, doctor, lawyer; engineer, other profession or occupation.) 51. .... 52. ....

....

....

....
(Describe the occupation clearly.)

2. Occupation of Mother .... 53. .... 54. ....

3. Estimated **family** income: 0-2,999. ....; 3,000-4,999. ....; 5,000-6,999. ....;
7,000-9,999. ....; 10,000-up ....; 55. ....

4. Work of Father: 1. in Edmonton ....; 2. Town or Village ....;
3. Farm .... 56. ....

5. Employer: (If father is not a proprietor) .... 57. ....

MEDICAL: (to be completed by the Health Unit)

1. Premature birth (birth weight below 5½ lbs.) Yes .... No .... 58. ....

2. Congenital physical defect: Yes .... No ....
If yes, type .... 59. ....

3. Allergies: eczema, asthma, hay fever (underline, if present) 60. ....

4. Hearing loss: 15 decibels or more, both ears: Yes .... No .... 61. ....
If yes, has it been corrected? Yes .... No ....

DO NOT
MARK
IN THIS
COLUMN

5. Visual defect: Yes.......... No.......... Corrected ....

If yes—below 20/40 in one or both eyes; Yes .... No .... 62. ....

above 20/40 in one or both eyes; Yes .... No ....

6. Tuberculin Test: Negative .... Positive .... 63. ....

7. Enuresis: Twice a week or oftener after 4 years of age:

Yes .... No .... 64. ....

8. Did child stammer or stutter seriously at any time during attendance at school? Yes ....

No .... 65. ....

VI. BEHAVIOUR: (please indicate rating by check mark)

Type	Negligible	Slight	Average	Above Average	Very Marked	
Social participation	....	....	....	....	....	66. ....
Aggressiveness	....	....	....	....	....	67. ....
Honesty	....	....	....	....	....	68. ....
Truthfulness	....	....	....	....	....	69. ....
Cooperativeness	....	....	....	....	....	70. ....
Emotional stability	....	....	....	....	....	71. ....

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